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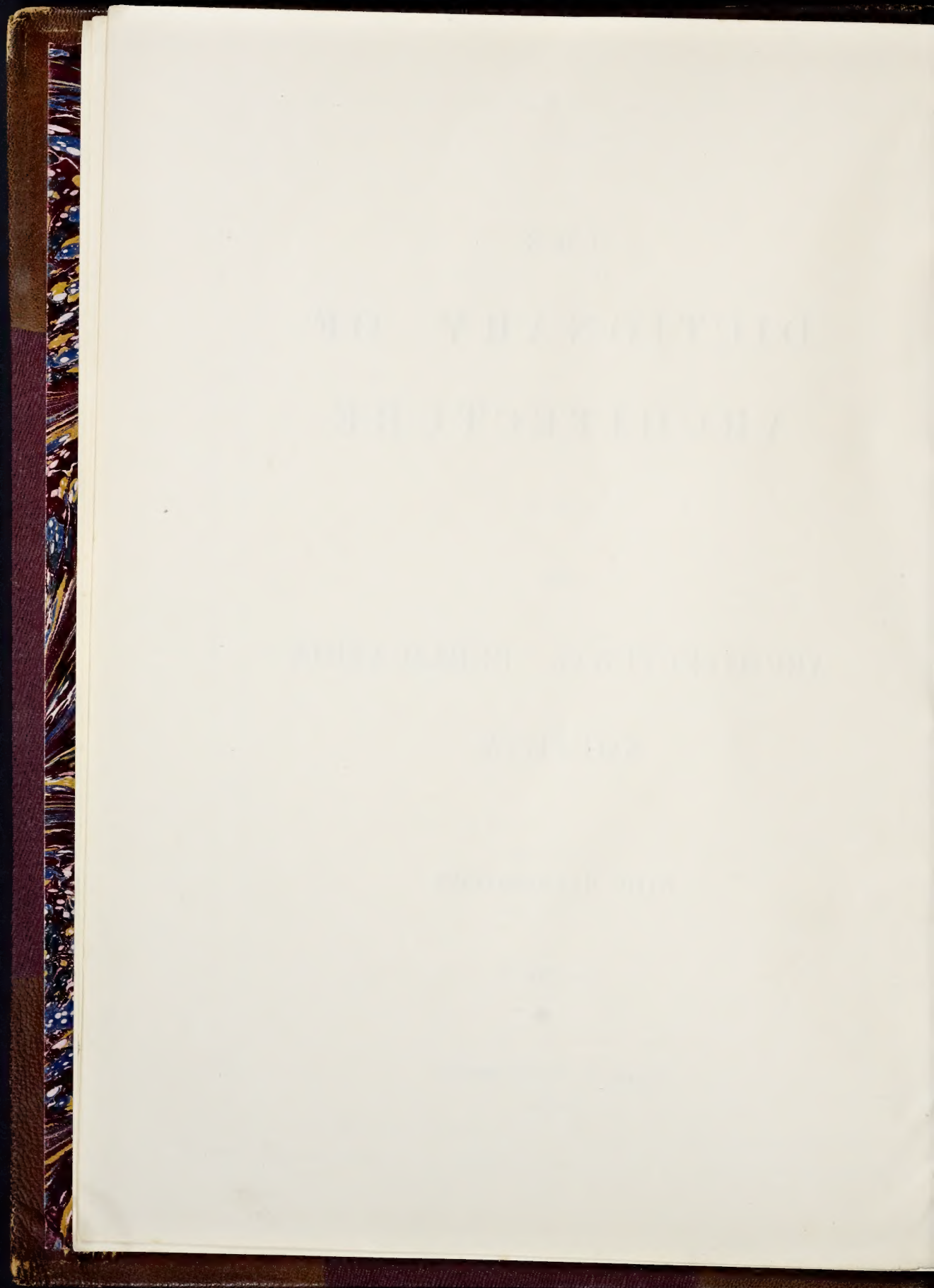
THE
ARCHITECTURAL PUBLICATION
SOCIETY.

WITH ILLUSTRATIONS.

VOLUME I.

PRINTED BY THOMAS RICHARDS.

LONDON.



THE DICTIONARY OF ARCHITECTURE.

A RETROSPECT.

1848-1892.

MR. WYATT PAPWORTH having in March 1848 issued a circular letter, setting forth the objects and plan of a "Society for the Promotion of Architectural Information: intended for the Revival and Restoration, Investigation, and Publication of Knowledge in Architecture, and the Arts connected therewith," a meeting of gentlemen who had expressed their willingness to assist in the formation of the Society was, on the 4th of May following, held at No. 10, Caroline Street, Bedford Square: when an influential Committee, comprising most of the leading Architects of the day, was appointed.

THE ARCHITECTURAL PUBLICATION SOCIETY was the designation adopted; and arrangements were ultimately made for the production and issue to Subscribers only, of "Detached Essays and Illustrations", dealing with subjects which might be hereafter incorporated in due alphabetical order, in a "Cyclopædia of Architecture", illustrated by selections of subjects, chiefly unpublished, from the portfolios of sketches placed at the disposal of the Committee: all being issued of an uniform size and type, every separate treatise would form a distinct article, which could at any time take its proper place according to the alphabetical arrangement.

The preparation of an "Alphabetical List of the Terms of Art and Science connected with Architecture", which were to be explained and illustrated, was also undertaken as a necessary introduction to the work.

The First Part of the Publications, comprising 12 Plates of Illustrations, was issued in April 1849.

The first General Meeting of Subscribers was held on the 31st of May 1850.

The issue of the "Detached Essays and Illustrations" was continued for four years, during which period the realisation of the objects for which the Society had been established was the subject of anxious deliberation by the Committee.

The "List of Terms" applicable to the subjects connected with the Art, proposed to be inserted in a "Cyclopædia of Architecture", was prepared by Mr. Wyatt Papworth; it was widely circulated in proof in three sections, advice and suggestions were received not only from members of the Committee but from learned friends throughout the country, with the result that the "List of Terms" contained 12,127 distinct headings or terms. The last section was issued in May 1852.

The names of the Committee which then had charge of the affairs of the Society may well be here recorded. They are:—Samuel Angell; Arthur Ashpitel, F.S.A.; Sir Charles Barry, R.A.; James Spencer Bell; W. J. Booth; Ewan Christian; Professor Cockerell, R.A.; Professor Donaldson; W. J. Donthorn; Francis Edwards; H. B. Garling; George Godwin, F.R.S.; W. G. Habershon; Edward T'Anson, F.G.S.; H. E. Kendall, F.S.A.; Robert Kerr; J. T. Knowles; T. Hayter Lewis; James Morant Lockyer; David Mocatta, F.S.A.; Charles Charnock Nelson; John Woody Papworth; Wyatt Papworth; W. Wilmer Pocock; J. J. Scoles; Sydney Smirke, R.A.; James Thomson; William Tite, F.R.S.; James Wilson, F.S.A.; James Wylson. The Honorary Secretary was Mr. Wyatt Papworth; and the Honorary Treasurer, Professor Donaldson.

Of the thirty gentlemen who thus forty years ago assisted in promoting the work now at last completed, six survive to see that completion.

In the Report presented by this Committee to a meeting of the Subscribers on May 10th, 1852, they said:—

"Impressed with a deep sense of the value and great importance of a Cyclopædia following closely the path indicated by the 'List of Terms', not only to the members of the profession, but to

all who are interested in the Art, the Committee, after several consultations, when the subject was fully discussed in all its bearings, decided to lay before this Annual Meeting a scheme by which such a work might be commenced, and efficiently carried out within determinate limits

"Fully alive to the impolicy of issuing a publication in a series of Parts extending over a long number of years, creating the apprehensions and exhausting the patience of Subscribers, it is hereby recommended, as a systematic and practical effort, that in consideration of the difficulty of working out the scheme of the *Cyclopædia* as hitherto contemplated, the project be carried into execution as a Dictionary of Explanation and Reference, with incidental woodcut illustrations and occasional lithographic plates, so arranged as to be completed in about three years at the present amount of subscription."

This proposal was adopted by the Meeting, and the Committee requested to proceed accordingly.

That the sanguine expectations formed by the Committee could not be realised: that even a combination of the most favourable circumstances, and a very large increase in the number of Subscribers, would not have rendered it possible; was soon discovered when the preparation of the first sheets of letter A was commenced: the time occupied in getting together the information, its condensation for first proofs, its correction and revision by the members of the Committee, and its final revision for press, occupied much time; while the delays arising from inquiries for particular information, the frequent cancelling of matter set up, and other incidents, seriously retarded the progress of the work.

The system adopted of extreme condensation and repeated revision caused an expenditure of labour on each page which can hardly be realised, necessitated the sacrifice of a large amount of collected material, and demanded the employment of much skill and patience.

The Committee of Revision has necessarily changed much during the progress of the work, but the following may be mentioned as having throughout and from time to time been included:—Professor Geo. Aitchison, A.R.A.; Arthur Ashpitel, F.S.A.; Arthur Cates; Geo. R. Burnell; F. P. Cockerell; Professor T. L. Donaldson; H. B. Garling; Octavius Hansard; Sir Horace Jones; Professor Robert Kerr; Professor T. Hayter Lewis, F.S.A.; James Morant Lockyer; Charles Charnock Nelson; R. Reynolds Rowe, F.S.A.; Professor Sydney Smirke, R.A., F.S.A.; Sir William Tite, M.P., F.R.S.; John Whichcord, F.S.A.; James Wylson; and many others.

The first part of the Dictionary, letter A, AACHEN—ALBUMEN, was issued in May 1853.

Difficulties and delays soon arose, the anticipated support of the Profession was not realised, and the funds likely to be available were manifestly insufficient to ensure rapid progress.

On the completion of the letter A, a Special Meeting of the Subscribers was held on the 15th November 1854, to consider whether the system adopted should be continued, when, after a complete explanation of it, and of the process of almost fastidious revision, it was decided that there was no reason to make any change.

In 1858, Mr. Wyatt Papworth, who since 1848 had acted as Honorary Secretary, was, at his request, relieved of the duties relating to correspondence and the ordinary business, so that his undivided attention might be given to the actual work of "The Dictionary"; and after a short interval these duties were undertaken by the writer of this notice.

The subjects of the Illustrations comprised in the 152 Plates have been selected from the portfolios and sketch-books placed at the disposal of the Committee by many architects, and after 1858 were arranged and produced under the direction of Mr. Octavius Hansard.

In 1869, an attempt was made to relieve the original Subscribers of further contribution by fixing the entrance subscription to new members at £15 15s., dependent on a sufficient sum being raised thereby to complete the work.

In 1870, successive losses by death of friends who from the commencement of the work had laboured zealously for it, culminated in the loss, among other indefatigable contributors, of Arthur Ashpitel, F.S.A., Geo. R. Burnell, and J. M. Lockyer, who had from the first been most energetic in the aid they had given; and the even more to be lamented decease of John Woody Papworth, whose death for a time almost paralysed the action of the Society, since during the first fourteen years he chiefly had prepared and revised the manuscript for press.

Thus, although from the commencement of the work to its completion the proofs have passed through his hands, the whole labour of producing and editing the text was thrown upon Mr. Wyatt Papworth at a time when the serious responsibilities consequent on his brother's illness and death, and on a large influx of professional engagements, occupied his entire attention, and even necessitated a temporary cessation of his labours on "The Dictionary".

In 1874, the subscription price for the whole work was raised to Twenty Guineas (£21), and it was anticipated that the funds which would be thus raised would prevent the necessity of any call being made on the original Subscribers or on those who had paid £15 15s.

Mr. Wyatt Papworth being enabled to resume his labours, at the end of 1878 the letters M, N, O, were issued; but in the same period further loss was sustained by the deaths of Professor Sydney Smirke, R.A., who from the retirement of Professor Donaldson had acted as Treasurer, and of Charles Charnock Nelson, for so many years the Hon. Sec. to the Royal Institute of British Architects, and from the first one of the most valued contributors and revisers.

Since 1878 the office of Hon. Treasurer has, to the great advantage of the Society, been filled by Professor T. Hayter Lewis, F.S.A.

In 1888, the letter S having been completed and issued, it was estimated that in order to produce the concluding volume, T—Z, a contribution of Two Guineas (£2 2s.) each would be required from all those who had not paid £21: this was cordially agreed to, and by aid of the funds so raised Volume VIII, completing the work, has now been produced.

For his services as Compiler, Editor, and Reviser of the text, Mr. Papworth has been allowed an honorarium per printed page, covering, so far as the Society was concerned, the cost of the manuscript, the remuneration of many of the contributors, and of others for translations, compilations, and condensations, and the labour of preparation and revision. Nearly all the Lists and References in the text, and most of the Biographies of English Architects, have also been supplied by him, but his initials are appended to but few of these contributions.

Very many of the articles have been revised by local correspondents and specialist writers; the few initials appended are those of the writers. An alphabetical list of most of these initials, with the names in full, is hereto annexed; and Mr. Papworth desires to express his warmest thanks to those contributors now living, and others whose occasional assistance had been asked and freely accorded, for the great courtesy with which they one and all attended to his requests.

Besides the lists of books contained in the articles, the numbers at the end indicate standard works of reference, in which fuller details will be found, and of which an explanatory list has already been issued.

The "List of Terms" issued in 1852-3 comprises 12,127 items. "The Dictionary" as completed contains 18,456 articles, the increase having been most remarkable in the later letters, for in T, U, V, W, the numbers have been respectively, Terms 594, 67, 258, and 248, while the Articles printed have been 1,108, 131, 567, and 712.

The total amount expended on "The Dictionary", which comprises 2,288 folio pages and 152 Plates, forming eight folio volumes of Text and three volumes of Illustrations, may be taken to be £9,550, which may be apportioned as follows:—MS. of "Dictionary", £2,600; Printing, £2,850; Lithographic and Woodcut Illustrations, £2,250; Advertising, £120; Binding and Delivery of Parts, £530; Rents, Curator, etc., £470; Miscellaneous Disbursements, £730.

ARTHUR CATES,

Honorary Secretary.

7, WHITEHALL YARD, S.W.

April 1892.

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April, 1892.

THE DICTIONARY OF ARCHITECTURE.

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* Indicates those Plates which were published as Illustrations to the *Detached Essays*—1848-52.

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THE DICTIONARY OF ARCHITECTURE.

[The figures at the end of the articles refer to works wherein detailed information will be found; the letters similarly placed refer to particular writers; and lists will be given hereafter.]

ABAC

AACHEN, the German name for AIX-LA-CHAPELLE.

AAKEN (JACOB VAN) of Friesland, died soon after 1529, while executing the Oldenhoofer campanile at Leeuwarden. 24.

AALBORG, a city in North Jutland; although nearly consumed by fire in 1530, contains, among other curious and interesting buildings, the episcopal palace, erected by Christian V in 1684; an old chateau for the residence of the bailli; four gates; two churches; a hospital, with its church; two almshouses; a *gymnasium* or college; the episcopal library; the cathedral school founded by Christian III in 1553; a navigation school, an exchange, hôtel de ville, and convent. 28.

AARHUUS (AGERHUS), a city in North Jutland. The cathedral, the largest church in Denmark, was erected, according to HELVADERUS, of stone, in 1201; the canon's buildings, in 1286; the altar of the Holy Spirit, in 1395; the chapel on the north of the tower, from 1450-82; the shrine of S. Christopher, in 1494; and the structure was completed in 1533. (LANGEBEK AND SUHM, *Scriptores Rerum Danicarum*, fol.; Hafnie, 1772-1834.) The chief spire, 600 (MURRAY) feet in height, was struck down by lightning in 1642. In the interior are several remarkable monuments. In the city are a parochial and an auxiliary church, an episcopal palace, a cathedral school or college, and a richly-endowed hospital. The bridge, of stone, communicating with the neighbouring island of Kalø, is about 1,441 feet long.

AARON'S-ROD. A term used by plasterers for a staff budding forth leaves, which has no other name; although STUART defines the word, "a rod with a serpent twined round it; also improperly called CADUCEUS".

AATYL, or ATIL, in Syria, once an important city, is now a small village. LABORDE (*Voyage en Orient*, etc. fol. Paris, 1838) illustrates the remains of two buildings on which are inscriptions in Greek. One of these edifices is in ruins, and the number of its columns cannot be ascertained; an arch over the main building still remains. Two Corinthian columns and as many pilasters decorate the other building.

ABABDE, or SHEIK ABABDEH, the modern name for ANTIOB.

ABACCO (ANTONIO), see LABACCO.

ABACISCUS and ABACULUS, the diminutives of ABACUS.

ABACUS (Gr. *ἀβάξ*, a flat board or tray; It. *credenza*; Sp. *abaco*; Fr. *tailloir*; Ger. *abacus*) is the term now generally used for the upper division of a capital, which was probably the primitive cap itself; and when not moulded, VITRUVIUS, iv, 3, etc., employs the word PLINTHOS, as if specially fitted for such cases. It forms an integral portion of the CAPITAL.

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ABAC

In some Ionic and in the ancient and modern Corinthian and Composite orders, the plan of the abacus is formed by arcs of a circle, called the curves of the abacus. The angles or horns in some instances terminate in sharp points; but they are generally cut off square with the diagonal of the capital.

The term abacus has been applied by Scamozzi to the concave moulding of the capital of the Tuscan pedestal; and Palladio states that the abacus of the Tuscan capital "is generally called dye or dado." VITRUVIUS, iii, 3, uses the term for the square under the cymatium of the capital of the Roman Ionic; but in the same book, and iv, 1, gives it the signification in which it is now employed. It is extremely curious that the ancient Greek writers did not use the word *abak* in this sense; AMMONIUS only employs it as a beaufet or sideboard.

ABACUS (in the sense of sideboard as mentioned above). CATO speaks of one of wood; and in VITRUVIUS, vii, 3, it appears that old plastering was cut from the walls and converted into abaci. In these cases it is a term for a slab of marble, or other material, and serving as a sideboard for the exposition of plate, which was likewise placed beneath, in cells or *cavernæ*. On a fictile vase, figured by RICH (*Companion*), s. v., the abacus is supported on a carved leg, while the vases are placed some upon the slab, and some under. There is little doubt that these abaci were in every house, however poor: the first introduction of the abacus from the East into Rome was in 187 B.C., when they were thought unusual luxuries. PLINY (*H. N.*, xxxiv, 8) mentions as an ornament of the abacus, the *mensa Delphica*, or *cortina*, which was a tripod of white marble to hold cups.

VITRUVIUS, vii, 4, directs that, in winter eating-rooms (*triclinia*) the abaci above the podia are to be coloured black and ornamented, with yellowish or reddish cunei inserted; RICH, s. v., gives a representation of a sepulchral chamber at Pompeii, surrounded by such a PODIUM or species of dado. This passage is probably illustrated by a custom still in use in Italy, of inserting small pieces of jasper or superior marble into slabs of inferior material, and polishing the whole together: but it does not appear clear whether he intends the whole abacus, top and face, to be treated in this manner, or only the face of the part touching and immediately above the podium. Other meanings have been given by the various commentators, which may be found, s. v., in the lexicon appendix to the Utini edition of VITRUVIUS. It must be admitted that the use of the word by PLINY, *N. H.*, xxxiii, 36, and xxxv, 15, directly points to its signification of panelling of a wall, and in xxxv, 1, its meaning is equivocal.

It will be seen that the diminutives *ABACISCUS* and *ABACULES* will have different meanings according with those above given of the root. Thus they signify the tesserae used for pavements (PLINY, xxxvi, 67; ATHEN., v, 207; EUSTATH., *ad Hom. Odys.*, x), as well as small square tablets or brackets used to support vases and other ornamental objects; even when used as synonymous with the root, they are more correctly applied to a square compartment inclosing a part, or the entire pattern or design, of a mosaic pavement.

A. A.

ABADIR (PAUL), of Angoulême, born at Bordeaux in 1783, a pupil of Bonfin and Percier, built the prison there, the front of the church of S. André, the law and police buildings, the little church of the Seminarium, and also restored many monuments of earlier times.

68.

ABAISER. A term employed by painters for burnt ivory, or ivory black, used to lower the tones of colours.

ABARCA (EL MAESTRO MIGUEL DE), of Beasain, in Guipúzcoa, Spain, died in 1683. He began in 1657 a chapel in that town to S. Martin de la Ascension y Loináz. In 1674 he was called upon to make, with Zunzunigui, the formal inspection, upon completion, of the works of the church and convent of the Franciscans outside of Tolosa.

66.

ABARÍA (EL MAESTRO ESTEBAN) constructed, about 1610, the tower of the parochial church of Sta. Maria de Oxirondo, at Vergara, in Guipúzcoa, Spain.

66.

ABATE (NICOLÒ DELL'), see MODENA (N. DA).

ABATED. Sunk or lowered. "The Marbler" agrees that "all the champes about the letters are to be abated and hatched curiously to set out the letters." Document respecting Beauchamp chapel, Warwick: BRITTON, *Arch. Antiq.*, vol. iv, p. 13.

ABATEMENT, or BATEMENT. A carpenter's term, used by old authors, signifying the waste of a piece of stuff by forming it to a designed purpose.

4.

ABATON. Supposed to be the ancient name for BIGGER.

ABATON. VITRUVIUS, II, 8, mentions this word as the term given by the Rhodians to their building round the trophies of Artemisia, which they had enclosed with a wall, and so rendered inaccessible.

ABATTOIR, the name given to the public slaughter-houses which were established in Paris by a decree of Napoleon in 1810, and finished in 1818. (See *Detached Essay*.)

ABBATE (NICOLÒ DELL'), see MODENA (N. DA).

ABBATHIE. Sometimes used for abbey, seems also to imply such dependencies of an abbey, as a parish is of a church.—KELHAM, *Domesday Book*, p. 147.

ABBATI (PIETRO), a pupil of Ferdinando Galli Bibiena, is noted for his etching of a catafalque, from a design by his master, in 1778.

Dict. des Artistes.

ABBEVILLE, a city in the Dep. of the Somme, in France. The houses are generally well built, and of brick; a few are of stone, and there are some picturesque specimens of ancient domestic timber architecture. Before the Revolution there were a collegiate church and fourteen parish churches, fifteen monasteries, three hospitals, a commandery, and a priory; mostly in ruins. The church of S. Wulfram, commenced on a magnificent design under Louis XII, suffered little injury; the most interesting portion consists of the first five arches of the nave, and the west front, of three gorgeous portals, with the gable flanked by two towers; the whole covered with the richest flowing tracery in panelling, the niches being filled with statues of saints. The remainder of the church is a mean continuation. The other principal objects are the tour du beffroi, five gates, a gymnasium or college with a public library, theatre, cavalry barracks, foundling hospital, baths, and a breeding stable for a stud of forty horses.—GILBERT, *Description, etc.*, 8vo., Amiens, 1836; LOUANDRE, *Histoire, etc.*, 8vo., Abbeville, 1834.

ABBEY, (It. *badia*, *abbazia*; Sp. *abadia*; Fr. *abbaye*; Ger. *abtei*, *kloster*), was a religious community obtaining the king's charter of protection and liberty, and raised from a PRIORY, with an abbot or abbess for head: the buildings appropriated to its

habitation soon received the same name. They were often of very great extent, with portions adapted to the religion, civil business, and social wants of their occupants. The wealthiest abbeys in former times were in Germany; and of all such foundations that of Fulda, founded in Franconia in 784, was preeminent and took precedence over all the other abbots of Germany and France. That at Gloucester had one hundred monks on the establishment; Bury S. Edmund's, eighty; S. Alban's, S. Mary of York, and Tewkesbury, fifty. Those of the second class had about twenty, while the third held about ten, and the fourth from three to six. There were also servants in proportion; Tewkesbury had one hundred and forty-four and Evesham sixty-five, besides grooms, porters, and farm-labourers.

The principal buildings of an abbey were the CHURCH, SACRISTY, VESTIARIA, CHAPTER-HOUSE, CLOISTER, REFECTORY, MISERICORDIUM, DORMITORY, INFIRMARY, HOSPITIA OR GUEST HALLS, LOCUTORIUM, LIBRARY, etc., WRITING-ROOM, STUDIUM, EXCHEQUER and sometimes a MINT, PRISONS, BAKEHOUSE and KITCHEN. The sanctuary was rather a precinct or close than a building, to which was attached one or more GATEHOUSES and the ALMONRY. The CEMETERY was frequently in the cloisters; gardens and orchards were close at hand, but the GRANGES, CELLS, and PRIORIES, were often at very remote distances. The ancient plan of the monastery of S. Gall in Switzerland, given in the fifth volume of the *Journal of the Archaeological Institute of Great Britain*, etc., 1848, is the best document to which reference can be made for the general arrangement of an abbey in early times. For similar establishments in England, see the authorities named below. Fountains Abbey (BURTON, *Hist. of Yorkshire*, fol., Lond., 1797; WALBRAN, *Pict. Guide to Ripon*, etc., 12mo., 1849; and *Reports, etc. of YORKSHIRE ARCHITECTURAL SOCIETY*, vol. i, 8vo., Lond., 1852) is a ruin from which more of the economy of monastic architecture may be learned than from any other in the kingdom.

FOSBROKE mentions that abbesses were deposed upon complaint of the nuns, even for inattention to repairs of buildings, a point very strictly impressed upon all governors of religious societies. The cloister and other arrangements significantly point to the Roman origin of such establishments. Several abbeys in England were fortified. Monte Casino in Italy; Cluny in France; Alcobaga in Spain; Batalha in Portugal, and S. Martin's in Hungary, were among the most considerable of the Roman, and those of Mount Athos of the Greek, ritual. OWEN and BLAKEWAY, *Hist. of Shrewsbury*, 4to. Lond. 1825; WHITAKER, *Hist. etc. of Whalley*, fol., Lond. 1818; YATES, *Illustr. etc. of S. Edmundsbury*, 4to. Lond. 1805; TANNER, *Not. Mon.*, fol., Camb., 1787. A list of abbeys is given by WEALE, *Dict.*

ABBOT'S LODGING was a complete house generally situated to the south-west of the church, with which it communicated by a passage through the cloister. Separate habitations are mentioned as early as the reign of King Alfred. They were furnished with every convenience of the time, and contained a great hall, chapel, library, great chamber, and various lodging-rooms. That at Glastonbury consisted of twelve apartments, the great chamber being 111 feet by 51 feet, and in the stables were forty-four horses. The great chamber at Peterborough was 99 feet by 30 feet; the great hall at Durham, 100 feet by 40 feet, and at Peterborough 96 feet by 36 feet. Private oratories called *secretæ domus* were attached to the hall. There were also city residences for the superiors of large establishments when called to Parliament, etc. At Kirkstall are very conspicuous remains. BLONDEL (*Cours d'Architecture*, 8vo., Paris, 1783, vol. iv, p. 357) cites, and gives a plan of, the abbatial house of the Premonstratensians at Villars-Cotterets, erected by Franque, one of the royal architects, in 1765.

ABBREVIATION, the shortening of a word or phrase, made either by omitting some letters or words, or by substituting some arbitrary mark, in which the Roman system has been generally followed.—ELMES, *Dict. of the Fine Arts*, 8vo.,

Lond., 1826; also, *ENCYCL. METROP.*, s. v., give a list of the principal ones which are seen upon ancient monuments.

ABDALLAH BEN KLAIB, according to an Arabo-cufic inscription in the cathedral of Tortosa, dated 947, erected a minaret named by the Arabs Almadena, more commonly Almadena. LABORDE, *Voy. pitt. etc. de l'Espagne*, fol., Paris, 1806.

ABDELRAHAMAN, a Moor of Segovia, chief master of the works, commenced building the principal church of the Carthusian monastery at Paular, in New Castile, in 1433, and finished it in 1440. 66.

ABEL (JOHN), one of the most famous architects of this country of his time, died in 1674, aged ninety-seven, and was buried at Sarnesfield, in Herefordshire. He built the market-houses of Brecon, Hereford (James I.), Weobley, with its school-house, Kington, and Leominster (1633), and the timber work of the church at Abbeydore; being in Hereford when the Scots besieged it in 1645, he constructed mills to grind corn, which were of great use to the besieged, and for which Charles I afterwards honoured him with the title of one of his majesty's carpenters. CLAYTON, *Coll. of Ancient Timber Edifices*, fol. Lond. 1846; CAMDEN, *Brit. edit.* by GOUGH.

ABELE TREE. The English name of *POPULUS Alba*.

AB ENEY is the name of a wood of Paulhant Jungle in the East Indies, used for furniture. It is of a brown colour, and forms a large tree. 71.

ABERDEEN. This name is common to two places situated very near to each other on the eastern coast of Scotland.

OLD ABERDEEN obtained the rank of an episcopal seat in 1136. The present structure of the cathedral (dedicated to S. Machar) was commenced in 1357, and the works were continued through the fifteenth century. The centre tower and choir were of freestone (the rest of granite). In 1688 the tower and spire fell, destroying the entire east end. The nave has been used as the parish church since the Revolution. The University of King's College is a quadrangular pile, founded by James IV, in 1494, and opened for students some time before 1506. The tower of the chapel is of freestone, and affords a well known example of the lantern formed by four curved and crocketed ribs springing from the angles, supporting a crown. BILLINGS' *Baronial Antiq. of Scotland*, 4to., Lond. 1852. There is also a town house, erected towards the close of the last century, and some small charitable foundations.

The old bridge of Don, formed of a single pointed arch about 66 feet 10 inches span, and 34 feet 6 inches high, was built early in the fourteenth century. A bridge of five arches was built in 1829-31, by Telford; and the bridge of Dee, erected early in the sixteenth century, of freestone, of seven arches nearly semicircular, was formed with ribs and covered with flat stones, the roadway being carried by spandril walls rising from them. In 1841 the bridge was widened on the west side, by the late Mr. John Smith, the city architect. The old face stones were rebuilt in the new outside.

ABERDEEN, or NEW ABERDEEN, is a royal burgh. The town house is a plain building, partly renewed in 1670, and again in 1750. A court house was erected behind it in 1820, by Mr. Smith, to whom also are due the following works:—the East prison, built in 1828-31, quadrangular in plan, 129 feet by 98 feet, with a central court divided into compartments by high walls; a turnkey's lodge being in the middle. The town schools, built in 1841, consisting of two wings and a centre, with a colonnade and a tetrastyle Grecian Doric portico. An arched gateway in front of S. Nicholas' churchyard, with Grecian Ionic columns in the centre of a façade, having on each side a range of six Ionic columns of a smaller size. The record office in King Street. The North church, of granite, built in 1830; in front is a tetrastyle Grecian Ionic portico, finished with a balustrade; a tower rises above it. The South, and also the S. Clement's churches, built about the same time, of granite, and of late Gothic, but plain.

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Of Gordon's hospital the original or centre building was designed in 1739 by James Gibbs, architect. In 1828-9, extensive additions of wings and colonnades on each side were made by Mr. Smith. The trades hall, in the Tudor style, was erected in 1847 from the designs of J. and W. Smith; and the very extensive new market, finished in 1842-3, was designed by Archibald Simpson, architect, Mr. Smith acting in conjunction with him towards its completion. Mr. Simpson also carried out the following works. The Post office. The North of Scotland bank, finished in 1842, having a circular Corinthian portico of finely dressed granite, the capitals being modelled after those at Tivoli. Marischal college and University, founded in 1593, and rebuilt in 1838-42, in the collegiate Gothic style, with a square tower in the centre, having an observatory on the top. The infirmary, finished in 1838, in the Palladian style; and the county rooms, commenced in 1820, having a hexastyle Grecian Ionic portico. The extensive lunatic asylum, which has been greatly enlarged at various times since its erection by him in 1819. The East, South, and West free churches, built in 1845, are arranged in one building of a cathedral form, with a tower and spire of brick. S. Andrew's episcopal chapel, built in 1816, of freestone, the front, the only ornamental part, being of the Perpendicular period. The East and West churches, built on the site of the ancient church of S. Nicholas, of which but few portions remain, viz., a chapel under the chancel, and the arches of the tower in the transept, a part of which is now converted into a vestibule common to the two churches. The date of the erection of the original church is unknown, but it was in a flourishing state during the thirteenth, fourteenth, and fifteenth centuries. The nave was 117 feet long and 66 feet wide, including the side aisles. In 1477 the choir, of freestone from Morayshire, was commenced, John Gray being appointed architect, with a salary of 25 marks yearly (£7 : 2 : 2), and Richard Ancram, master mason; it was finished in 1508. In 1835 this part, called the East church, was rebuilt in the Late Decorated Gothic style by Mr. Simpson. In 1742 the columns of the old nave or West church gave way, and it was rebuilt, in 1751, of freestone, by James Gibbs, in the Roman style.

In the bridewell or West prison, finished in 1809, James Burn, of Haddington, architect, each convict has two rooms. He also designed the Aberdeen bank, in 1801. The episcopal chapel of S. John the Evangelist was consecrated in 1851, it is of granite with freestone dressings, and in the Early Decorated Gothic style; the tower is unfinished; Messrs. Mackenzie and Matthews, architects, who also designed the new college for students of the free church, in the Late Gothic style, and the large poor's house, recently erected. The remaining principal erections are the mechanics hall by Mr. Simpson, carried out by Wm. Ramage; the commercial bank of Scotland, etc., and Union bridge, of granite, consisting of one arch of 130 feet span and 30 feet rise, finished with a balustrade. It was erected in 1804 from a design by Rennie, altered, and carried out by Mr. Fletcher, superintendent of the city works. It forms a portion of Union Street, which was planned at the commencement of the present century as the chief approach to the town: it runs in a straight line nearly a mile in length, and 70 feet in width; and being lined on both sides with granite buildings, although the architecture is necessarily plain with such materials, the effect is imposing. The present grammar school was erected in 1757. In Greyfriars or the college church are some remains of old work, and a curious window at the south end. The cross is a hexagon of about 20 feet diameter, built of Morayshire freestone. Six Ionic columns, 9 feet high, with pilasters, support a dodecagonal parapet, containing alto-relievo images of ten Scottish sovereigns from James I to James VII, with the tower's and the royal arms. The cross is groined, having a centre pier, which carries a Corinthian column, 12 feet 6 inches high, wreathed with thistles, and surmounted by the unicorn, of marble, carrying the arms of Scotland. The

cross was erected on the site of an ancient one in 1686, at a cost of £100, and was removed and rebuilt in 1841. A colossal statue in Aberdeen granite, standing on a plain pedestal of Peterhead granite, is a monument to the late Duke of Gordon; Campbell, of London, sculptor. The principal quarries from which the buildings were erected are those of Rubislaw, Dancing Cairn, and Persley, all in the immediate neighbourhood, producing the grey granite of Scotland; the red granite is found at Peterhead, about 30 miles further north, in Aberdeenshire. (GRANITE.)

W. S.

ABERTHAW lime-stone, see LIME.

ABIELL (GUILLERMO) was one of the eleven architects who assembled at Gerona, January 23, 1416, to advise as to the plan for the completion of the cathedral, and is described in the report as master of the works of the churches of our Lady del Pino, S. Maria of Monte Carmelo, of Monte Sion, of S. Jago, and of the Hospital S. Cruz, all at Barcelona. 66.

ABIES, the fir, is a genus of trees of the coniferous tribe; of various sizes; usually with a straight, conical, undivided trunk, from which spread horizontal or drooping branches, arranged in a more pyramidal manner than PINES, from which it also most obviously differs in having the leaves, whether deciduous or evergreen, sitting singly on the stem. Of its four natural tribes the following species are the most interesting:

TRIBE I.—SILVER FIR.

1. A. PICEA, Silver F.—Locality, Mid. and S. Europe.—Height, 140 feet.—Yields Burgundy pitch and Strasburg turpentine; wood soft.
2. A. Grandis, Great Californian F.—California.—200 feet.—Soft, white, and of inferior character.
3. A. Balsamea, Balm of Gilead F.—W. of N. America.—40 feet.—Light, of a pale yellow; used for staves.
4. A. Nobilis, Large Bracted F.—California.—Large.—Excellent quality.
5. A. Frazeri, Double Balsam F.—Carolina and Pennsylvania.—10 feet.
6. A. Webbiana, Webb's F.—N. of N. India.—85 feet.—For planes by the natives (and called by them *oumut*).
- A. Canadensis, Hemlock Spruce F.—Near Quebec, etc.—75 feet.—Not sound or durable; laths, and in-door work.
- A. Brunoniana, Deciduous Spruce F.—N. India.—75 feet.—Bad, and warps (*angshing* and *changthasi-dhyu*).
9. A. Religiosa, Sacred Mexican F.—Mexico.—Branches employed to adorn churches (*oyamel*).

No. 2 grows detached; 1, 2, 3, 6, are adapted for plantations, etc., in this country; 5, for lawns, etc., where wanted to break lines, but not to intercept the view.

TRIBE II.—SPRICE FIR.

10. A. Excelsa, or Communis, or Pinus Abies, Norway S. F.—N. Europe.—160 feet.—Yellow or brown white; fine even grain; very durable.
11. A. Alba, White S. F.—N. of N. America.—45 feet.—Inferior quality.
12. A. Nigra, Black or Red S. F.—Ditto.—75 feet.—Strong, light, and elastic; yards of ships, and for floors, but apt to split.
13. A. Douglasii, Douglas F.—N. W. America.—150 feet.—Heavy, firm, as dark as yew; few knots, not liable to warp.
14. A. Menziesii, Menzie's F.—N. of N. California.—Excellent.

No. 10 gives the white or Christiania deal of the Norway markets; inferior to that of the common pine in durability and bulk, and being knotty, is not proportionally strong for horizontal bearings; used for a great variety of purposes in building, for masts, etc.; equally durable if cut at any age, like the larch. The tree may be cut for rods, stakes, etc., when the trunk is not more than two inches diameter. Trees of the age of about seventy-five years are those generally cut for exportation, each yielding on an average three pieces of timber in its length, 11 or 12 feet long: and each length giving three deals or planks, about 3 inches thick and 9 inches wide. DEAL. Grows singly in rich soil, forming a most beautiful object, but when crowded together it soon becomes very inelegant, and only of value for poles, for railway sleepers, fencing, etc. The market is also supplied from America. The foliage of 11 is characterized by a bluish cast, and that of 12 by a more sombre hue. 12 and 13 form immense forests; the latter, lately imported, resists this climate, and is likely to prove more valuable than even the larch itself, being evergreen and equally hardy.

TRIBE III.—LARCH FIR. (Deciduous.)

15. A. Larix, Common L. F.—M. of Europe, Russia, and Siberia.—Great excellence and quality; honey yellow colour; naval and building purposes, cabinet work, railway sleepers, fencing, etc.
16. A. Microcarpa, Red L. F.—N. America.—Heavy, scarcely swims in water.
17. A. Pendula, Black L. F.—Ditto.—Less valuable than 15.

15, in the spring, has a peculiar yellowish-green tint, possessed by no other tree of our forests. All three have a very graceful effect produced by drooping branches. If the land be well drained, 15 is one of the most profitable of all trees to the planter, growing with great rapidity. Yields Venice turpentine. VITRUVIUS wished for its use at Rome, from its durability in all situations. WIEBEKING prefers it to the pine, pinaster, and fir, for arches of timber bridges. It is well suited for flooring-boards and stairs, where there is much wear, and when oiled assumes a beautiful colour; used for internal joinery, and varnished, it has a still better appearance. Although more difficult to work than the Riga or Memel timber, the surface is better when obtained. 16 is distinguished from it by very small and bright purple cones, and is not so well adapted to the planter's purpose. 17 is like 15, but of a brighter green colour, and much more graceful; the branches droop and form a natural arch of great beauty.

TRIBE IV.—CEDAR FIR. (Evergreen.)

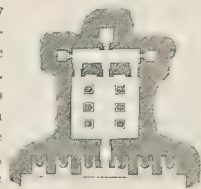
18. A. Cedrus, C. of Lebanon F.—Largest now remaining is at least 9 feet in diameter.—Of indifferent quality; fancy ware, cabinet work.
19. A. Deodara, Sacred Indian F., and two other var. (*Shimlik* and *Christa roooca*—India, near Rohilkund; Alps of Nepal and Thibet, etc.—100 feet.—Trunk 4 feet diameter; extremely durable; takes a high polish, being very close grained. (*Deodara* or *Godtree*).
20. A. Momi, many var.—Japan.—White and fine grain.

The growth of 18 will vie in rapidity with almost any forest tree. Cedar wood has the reputation of being indestructible, instances have been named of its being uninjured after a lapse of 2,000 years; but it is conjectured that the cedars of the Greeks was the wood of *CUPRESSUS horizontalis*, of *JUNIPERUS oxycedrus*, or of *TRUJA articulata*. 19, is so resinous that laths of it serve for lights. Spars taken out of Indian temples known to have been erected from 200 to 400 years were uninjured, except in those parts that were originally sapwood. Specimens have been procured from the starlings of the Zein ool kuddul bridge at Ladakh, where it had been exposed to the water for 400 years. The great rule for the proper cultivation of this species is to allow ample room for the extension of their branches, thereby ensuring their beauty; and the rate at which they will form timber, will be an ample recompense for the space they occupy. 14.

ABIFF, see HIRAM.

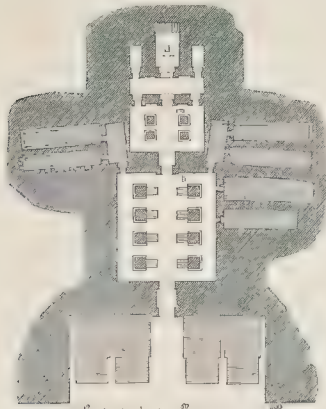
ABO, pronounced OBO, the capital of the district of the same name and of Finland, was nearly consumed by fire in 1827, losing 786 out of 1100 houses. It has a castle, hôtel de ville, college, palais de justice, custom-house, deserted observatory, and a cathedral, valuable for its interior, which is of three epochs, and for its organ of 5,000 pipes, the largest in the North, replacing that lost in the fire. 28.

ABOOSIMBEL (ABOCCIS, ABOSHIER), on the west side of the Nile, contains the most interesting remains in Nubia and (excepting Thebes) along the valley of the Nile. It has two grand temples, of the time of Rémeses the Great, cut in the sandstone rock. The small temple dedicated to Athor has a sloping façade. On each side of the doorway are three standing colossi about 30 feet high, sunk in recesses, to which they are attached by a portion of the rock left on purpose. According to GAU, each of these figures stood between two smaller ones not more than five or six feet high. The width of the front is about 90 feet, and the dis-



Scale as larger Temple.

tance from the doorway to the back wall of the adytum is about 76 feet. A hall about 36 feet square contains six square pillars, with Isis-headed capitals.



The larger temple, dedicated to Ré, is a few hundred feet distant, on the opposite side of the valley. The width of the front is about 100 feet, and the height from the sill of the door to the top of the cornice is 86½ feet. The door is 20 feet high, and on each side of it were two colossi, more enormous than any other in Egypt or Nubia, the face being 7 feet long, and the height

of the figure, if standing, 52½ feet: one of them has partly fallen down from the rock to which it was attached, and together with another is covered by the sand. From some traces of colour upon them, it is probable that these statues were painted. A bas relief 20 feet high came between the door and cornice, and above the cornice is a row of twenty-two cunecephali, about 8 feet high and 6 feet across the shoulders. The temple is about 150 feet deep from the door to the back wall of the adytum, and contains fourteen chambers. The great hall is about 55 feet square, in which are eight pillars, and against each is a colossal figure 17 feet 6 inches high, almost detached, which, reaching the roof with its high cap, appears to support the superincumbent mass. The adytum is 23½ feet long and 12 feet wide, with four painted colossi seated at the extremity. In the centre of the room is a pedestal, which has suggested that this excavation is a tomb and not a temple. GAU (*Antiq. de la Nubie*, etc., fol., Paris, 1822, Pl. 54-61.)

ABRAHAM (ROBERT, F.S.A., born 1774, died 11th December 1850, aged 76, son of a builder, was pupil of the surveyor James Bowen. He enjoyed an extensive practice in references and arbitrations, secured by his practical knowledge, which also gave him an introduction to valuable connexions. Among his works may be mentioned the new Westminster bridewell (1830); the synagogue in S. Alban's Place (1827); the houses on the Berner's estate in Oxford-street (1836); the County fire-office and other buildings (Carbonell's) in Regent-street (1819); works at Arundel Castle, Workop Manor, Farnham Hall, and Norfolk House (from 1818), for the Duke of Norfolk; numerous works for private individuals: and, conjointly with his son, the conservatories and garden buildings for the late Earl of Shrewsbury at Alton Towers (1824). A gold box was presented to him in 1842 by the following of his pupils:—G. Alexander, H. Flower, J. Lockyer, T. Little, R. E. Phillips, M. J. Stutely, and the late J. Woolley.—*BUILDER Journal*, vol. viii, 1850.

H. R. A.

ABRAUM, a species of red clay, used in England by cabinet-makers, etc., to give a red colour to new mahogany. It is found in the Isle of Wight, Germany, and Italy. 13.

ABREUVOIR. (It. *abbeveratojo*; Sp. *abrevadero*; Fr. *abreuvoir*; Ger. *schuennme*.) A watering-place for cattle, generally made with a gentle inclination to the bottom, so that beasts may walk into the water. It also means a kind of wall of plaster, or clay, built round the passage through which grout is poured between the beds and joints of stone (Ger. *steinfuge*), and not as sometimes explained, the interstice in which the grout is to form the actual joint.

G. R. B.

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ABRIL (EL MAESTRO BARTOLOMÉ) with J. B. Semería executed in 1586 the fountain and balustrade of the cloister of the College and Church of Corpus Christi at Valencia: and in 1620 was engaged with him and others on the Pantheon of the Escorial; from the designs of Juan Gomez de Mora. 66.

ABRUPT. This word is employed to express that want of grace which occurs by the sudden breaking off of an outline, when a building rises from the ground, or one part of an edifice from another, without anything to lead the eye to it; when a piece of ornament starts at an angle which is not in accordance with the preceding lines; or when an outline is produced which suggests the idea of incompleteness.

ABRUZZO (PIETRO), was employed at Naples in the eighteenth century. 64.

ABSIS, see APSE.

ABSORBENT, see ABSORPTION.

ABSORBING WELL. (It. *smaltitojo*, or *pozzo assorbente*; Fr. *puits absorbant*; Ger. *einsaugend brunnen*.) A shaft, or boring, carried through an impermeable upper stratum to a permeable subjacent one, by means of which either the excess of the drainage waters, or the foul waters produced by certain manufacturing operations, may be removed without flowing upon the surface. In some parts of England absorbing wells are known under the name of dead wells, but although generally speaking such dead wells are used as cesspools, there is this important difference between the two, that the absorbing wells are expressly designed to carry off fluids "per descensum," whilst all properly constructed cesspools should be lined with such materials as to retain everything, solid or fluid, which may be conducted to them.

It has been ascertained, experimentally, that any well communicating with a water-bearing stratum can absorb the same quantity which it is able to furnish. Thus: if a well yield one hundred gallons per minute at a height of three feet above the surface, it may be made to absorb one hundred gallons per minute by prolonging the tube through which the water rises to an additional height of three feet. Should it be desired to make such a well absorb five hundred gallons per minute, a pump should be placed upon the ascensional tube, and observations be made with respect to the lowering of the water line by raising that quantity. Then, by lengthening the tube so that it shall exceed the natural water level by so much as that level is depressed by the abstraction of the five hundred gallons per minute, the quantity of five hundred gallons per minute may be poured in without any danger of its overflowing. If the natural water line in the well be below the surface, the absorption will be very copious.

Evidently the quality of the waters descending will affect the surrounding strata within periods of greater or less duration, according to the permeability of the strata; and, if the waters should contain much slimy matter in suspension, they will inevitably choke up the interstices through which they filtrated in the beginning. The latter inconvenience may be obviated, to a certain extent, by causing them to deposit any heavy matters they may hold in suspension; but the success of such precautions must always be limited, because the finer particles will still be carried over, and in the end they will choke the absorbing surfaces. But the danger of contamination to neighbouring wells by the establishment of absorbing wells in factories is so great, that the latter should only be resorted to in extreme cases. In France no such well is allowed to be formed without the consent of the municipal authorities, and a previous examination of the locality. In our own country there is absolutely no legislation upon subterranean water courses: yet the gradual contamination of the well waters in such towns as London, Manchester, and Southampton, would seem to call for some regulations with respect to the mode of disposing of many fluids now conveyed to the absorbing strata beneath them by means of dead wells.—EMMERY, *Puits Artésiens d'Absorption*, etc., 8vo. Paris

G. R. B.

C

ABSORPTION. (It. *assorbimento*; Sp. *absorción*; Fr. *absorption*; Ger. *das einsaugen*) is properly the successive and intimate penetration of a gas, or a liquid, into any substance; but familiarly, the taking up moisture, in any material, by capillary attraction. Real absorption becomes substantially a chemical combination, as in the case of the absorption of oxygen, hydrogen, or carbonic acid gases by mineral bases; or it may seem to take place simply by condensation of the gas, or fluid, in the pores of the substance taking it up. Occasionally this condensation is so intimate, that a very high degree of temperature even will not suffice to drive off all the gas. Every solid body appears to absorb moisture from the atmosphere, even when the air itself does not appear to be saturated with it; the quantity of vapour taken up varying with the condition and nature of the body, and the hygrometric state of the air. ROMFORD found that 100 parts, in weight, of wood thoroughly dried, absorbed when exposed to the open air, 10 parts of water in summer, and 24 in winter; and that some minerals, such as pulverized oxide of copper, absorbed water with much greater avidity than others. LESLIE also noticed this fact.

The durability of building materials is so seriously affected by their powers of absorption, that the laws regulating it require to be carefully studied. To quote the Report of the Commission for the selection of the Building stone to be employed for the Houses of Parliament, "as a general remark, those stones" (or other materials) "which have the greatest specific gravity possess the greatest cohesive strength, absorb the least water, and disintegrate the least by the process which imitates the effect of weather". But it appears that the rapidity of absorption is by no means an invariable criterion as to the durability of a stone, because the shape of the minute cells has a very important influence upon the resistance which they may offer to the expansion of the water in freezing, and this is the most serious cause of disintegration practically to be dealt with. CONGELATION.

G. R. B.

ABSTRACT (It. *astratto*; Sp. *compendio*; Fr. *résumé*; Ger. *auszug*), used by surveyors, artificers, etc., to signify the collection in one amount, of the various small quantities of each article occurring in any work, for the purpose of expeditiously and conveniently ascertaining the total quantity which is to multiply the price of a determinate portion of each, as a yard, a foot, etc. It naturally follows that the calculations of the various gross quantities of the whole work at their several prices, may be made into an abstract showing the cost of each portion of a work; or of each artificer's work; or of the amounts expended in given periods.

ABSTRACT, of title, means the summary of the substantial contents of the title-deeds of a property. Such an abstract is always essential in valuing an estate, and often in deciding upon alterations of property.

T. T.

ABSTRACTION AND ABSORPTION OF HEAT is that process under which caloric, or heat, passes from any body to whatever surrounds it, or to any conducting substance with which it is in contact. It must, of course, be understood that the temperature of the body which loses heat must be greater than that of the medium, or of the conducting substance. The freedom with which the heat is propagated is termed the conducting power of that body.

14.

ABUSE, (It. *abuso*; Sp. *abuso*; Fr. *abus*; Ger. *missbrauch*), understood as meaning a wrong use of anything. That which is in itself good and true may be abused by carrying to excess its practice and the consequent results, and it may be still more abused by erroneous applications. The principles of imitation and the rules of execution, in architecture, demand from the spectator concessions, without which it would cease to be an art, and would return into the sphere of mechanical labour; and these concessions, the exceptions to the rules, are the most natural and most ordinary causes of abuses in architecture, as paradoxes and sophisms have arisen out of the ex-

ceptional modification of the principles of philosophy and morality.

Most abuses have sprung from a mania for ornament and novelty, and from a few exceptions to the principles of mathematical regularity, and to the system of analogical imitation adopted by architecture: the terms, **FAULTS** or **VICES**, are more proper than abuses, for contraventions of rules, which have physical experience and scientific demonstrations for their material and incontestable bases. Some abuses in architecture, as in language, are so customary that there is no chance of correcting them: and there are abuses, legitimated by the force of habit, so necessary, as to be almost converted into rules: it may be said that as a license is an exception to a rule, so abuses are the extensions given to an exception. PALLADIO has given a chapter (lib. i. c. 20) upon the subject, in which he quotes four abuses; PERRAULT doubled the number; MILIZIA (*Dict. d. v.*) enumerates twenty-five; and certainly more could be found.

25.

ABUSE, in the sense of the Ger. *verführung*, is also used when an attempt is made to deceive the sensuous faculties; as by the use of brilliant colouring to conceal defective forms, faulty proportions, or bad construction; or of painted perspective; or of perspective effects, irregularly, although scientifically obtained.

ABUTMENT. (It. *coscia*; Fr. *culée*; Ger. *angrenzung*.) The mass of material upon which the thrust of an arch, vault, or strut is discharged. The conditions of stability of an abutment are that its statical weight should be in excess of the forces to which it is exposed, whether they tend to throw it over on the outer edge, to cause it to slide upon its foundations, or to allow the arch itself to spread at the springing line. In order to ensure this, many engineers multiply the theoretical statical weight by a coefficient varying from 1.38 to 1.40 and even to 1.90: but the latter value is evidently exaggerated.—GAUTHY, *Construction des Ponts, etc.*, edit. par NAVIER, 4to., Paris, 1816; HAHN and HOSKING, *Essay, etc., on Practice, etc., of Bridges*, 8vo., London, 1842; MOSLEY, *Mech. Principles, etc.*, 8vo., London, 1843.

G. R. B.

ABUTTAL (Fr. *aboutissant*). In a description of a site of land the sides or the breadth are more properly *adjacentes*; and those terminating the length, which in old surveys are sometimes expressed by *capita*, are *abutantes*; whence abutalls are now called headlands.—ENCYC. BRIT. CAMDEN observes that limits were formerly distinguished by hillocks raised on purpose, which were called *botentines*, whence **BUTTINGS**.

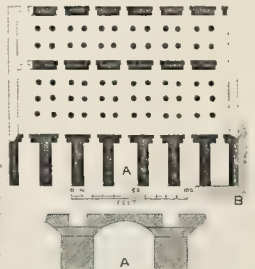
41.

ABUTTING JOINT, or **ABUTMENT**, among carpenters and joiners, is the joint or joining of two pieces of timber, in which the fibres or grain of the wood of the abutting pieces should be placed as nearly as practicable in a direction at right angles to each other.

2.

ABYDOS (Arabic, *EL MATFOON*; Coptic, *Ebôr*) on the west bank of the Nile, contains the remains of two fine edifices, of the time of Osirei I and his son Rémeses the Great. Tradition ascribed to Abydos a rank next to that of Thebes. The famous and important regal tablet, now in the British Museum, was found on the wall of a chamber in the temple of Osiris, completed by Rémeses the Great, who enriched it with a sanctuary lined with Oriental alabaster.

The other edifice, called by STRABO the palace of Memnon, is constructed, contrary to the general practice in Egyptian buildings, of both limestone and sandstone. It still exhibits the remains shown on the plan, and the ruins of vaulted colonnades extend in every direction from the angle marked B. The vaults both in these ruins and of the row of chambers marked A, are formed of sand-tone blocks,



Plan of Temple, and Section of Roof of Chambers.

probably from the quarries of Silsilis, reaching across from one architrave to another and laid on their edges, not as usual on their sides; leaving a mass into which an artificial vault has been cut, covered with sculpture, and coloured. Abydos also possesses a cemetery with many tombs of the 16th, 17th, and 18th dynasties, and stelæ from the time of Osortasen to that of Sabaco. *Descr. de l'Égypte*, texte iv, 1, x, 386, Pl. iv, 36, 87.

ABYSSINIAN ARCHITECTURE. (See *Detached Essay*.) 2, 14.

ACACIA, the name of a plant of the pea tribe. As objects of ornament they are usually of striking beauty; and it may be doubted whether, in the whole vegetable kingdom, equally brilliant coloring and elegant foliage, combined with a most graceful aspect, are united in the same individuals. Botanists are acquainted with nearly three hundred species, but the greater part can only be cultivated in this country in conservatories in open borders, where they attain to 15 feet in height.

1. *A. discolor*, Purple stemmed *A.* (*scutellaria*).—New Holland.—Succeeds well near London, if protected during winter. *A. affinis*; *A. Houstoni*; *A. julibrissin*; and a few others are now indigenous. 14.
2. *A. melanoxylon*, Black wood.—Van Diemen's Land.—A very hard, close-grained, dark, and richly veined wood; well adapted for cabinet work of all sorts: may be had in any quantity, and of large size. Its dark hue contrasts well with the equally beautiful light wood of the *Huon* (*Dacrydium*) pine.
3. *A. species* supplies rose-wood or zebra-wood.—Van Diemen's Land.—cabinet-makers.—Said to be plentiful in Lake county and about Marlborough.
4. *A. dealbata*, Silver Wattle, is another variety.
5. *Acacia* (*populea*).—Two varieties.—Tavoy.—Large trees.—House building, posts, bows, rollers, etc.
6. *A. mollis*.—Nepal.—Large tree.—Wood soft.
7. *A. fragrans* (*goolchumahl*).—Nepal.—Very large tree.—Wood useful.
8. *A. odoratissima* (*jatikoria*).—Gualpara.—Hard; furniture.
9. *A. marginata* (*kornit*). Ditto. Yields good planks.
10. *A. horrida*, Thorn *A.* (*doorn boom*).—Cape of Good Hope.—9 feet high, and 1½ feet diam.—Hard and tough; fire-wood.
11. *A. arborea* (*moruro*). *A. litoralis* (*moruro de costa*), and *A. formosa* (*sabich*).—all from Cuba.—Wood dense. 71

ACACIA TREE, the English name for ROBINIA.

ACADEMICIAN (It. *accademico*; Sp. *académico*; Fr. *académicien*; Ger. *akademiker*), a member of the governing portion of an academy.

ARCHITECTS WHO HAVE BEEN ROYAL ACADEMICIANS, *i. e.*, MEMBERS OF THE ROYAL ACADEMY OF ARTS IN LONDON.

Nominated.		Died.	
Sandby, Thomas	1768	Professor of Arch. 1768	1798.
Chambers, Sir William	1768	Treasurer, 1769	1796.
Gwynn, John	1768	—	1786.
Tyler, William	1768	—	1801.
Dance, George	1768	Professor of Arch. 1798	1825.
Elected			
Wyatt, James	1785	President, 1805	1813.
Yenn, John	1791	Treasurer, 1796	1821.
Soane, Sir John	1802	Professor of Arch. 1806	1837.
Smirke, Sir Robert	1811	Treasurer, 1820	—
Wyattville, Sir Jeffrey	1824	—	1840.
Wilkins, William	1826	Professor of Arch. 1837	1839.
Cockerell, C. R.	1836	Professor of Arch. 1839	—
Gandy (Deering), J. P.	1838	—	1850.
Hardwick, Philip	1841	Treasurer, 1850.	—
Barry, Sir Charles	1842	—	—

ARCHITECTS WHO HAVE BEEN ELECTED ASSOCIATES OF THE ROYAL ACADEMY OF ARTS IN LONDON.

Elected		Died.	
Stevens, Edward	1770	—	1775.
Bonomi, Joseph	1789	—	1808.
Gandy, Joseph	1803	—	1844.
Smirke, Sydney	1847	—	—

C. R. C.

A list of the Members of the French Academies of Architecture will be found in *L'Univers Pitt. Europe*, vol. xiii., s. v.

ACADEMIST (It. *accademista*; Fr. *académiste*; Ger. *akademist*), a pupil of an academy.

ARCH. PUB. SOC.

ARCHITECTURAL STUDENTS OF THE ROYAL ACADEMY OF ARTS IN LONDON WHO HAVE RECEIVED GOLD MEDALS.

Gandon, James	1769	Smirke, Sydney	1819
Yenn, John	1771	Kelsey, Richard	1821
Whetton, Thomas	1774	Bradbury, Thomas	1823
Soane, John	1776	Russell, H.	1825
Moss, William	1778	Loat, S.*	1827
Malton, Thomas, jun.	1782	Grellier, William	1829
Hadfield, G.*	1784	Payne, J. D.	1833
Bond, John	1786	Johnson, John*	1835
Sanders, John	1788	Gifford, E. A.	1837
Gandy, Joseph	1790	Falkener, Edward	1839
Gifford, Edward	1792	Campbell, W. H.	1841
Atkinson, William	1797	Garling, Henry B.	1843
Wilson, Thomas	1799	Johnson, Arthur G.	1845
Lochner, W. C.	1801	Ramsay, E.	1847
Bushy, Charles	1805	Allom, Arthur	1849
Adams, James	1807	Robinson, John	1851
Edwards, Francis	1809		
Vulliamy, Lewis*	1811		
Thomas, M. E.	1813		
Smith, Charles H.	1815		
	1817		

* Architectural travelling students of the Royal Academy of Arts in London.

C. R. C.

ACADEMY (It. *accademia*; Sp. *academia*; Fr. *académie*; Ger. *akademie*). The study of philosophy under Plato was pursued in a grove called *akadēmia*, near Athens; to attend his school was to go to the Academy, hence within fifty years that system of philosophy became known by the same name. But in ancient times the origin was so well understood, that edifices appropriate to the study of philosophy were still called academies, such as a villa belonging to Cicero near Puteoli.

At the revival of learning in the fifteenth century, the associations of artists and literary men, however, seem to have called themselves academies after the manner in which the Platonic school was designated, and hence was obtained the usual signification of the word, as a body associated for improvement in the liberal arts and sciences. By another and equally facile change, the word regained, in popular acceptance, its original meaning, viz. that of a place for the meetings of such an assembly. Abroad, the term is almost restricted to establishments under government patronage, and aiming at teaching, not a few young pupils, but the whole nation, if not the world; in England, these are generally termed societies, associations, etc. Academy is also the name usually given in this country, and on the continent, to an institution for the cultivation and promotion of the fine arts. These establishments partake both of the character of colleges or schools, and of associations such as those above mentioned as dating from the fifteenth century. Such a body proposes to fulfil two objects: 1, the promotion of the theory of the art by lectures, lessons, exhibitions, etc.; and 2, the cultivation of the practice of the art by means of academical honours. The members meet at stated times, for the purpose of conference on objects interesting to and connected with the arts, and reciprocally communicate their observations, sentiments, and discoveries in the course of their practice, or results of their experiments.

There are perhaps no academies of architecture, specially so called, at present in existence; one was founded by Colbert at Paris, in 1671, but it is now part of the Académie des Beaux Arts. The Institutes of architecture in this country are essentially the same as that of Paris, in everything but name, restriction of number, and government support. On the other hand, the architect Venturoli gave his noble bequest expressly for a COLLEGE, which was consequently founded at Bologna in 1825. The academies of France, Florence, and Naples, at Rome, are simply establishments in which the pupils selected from their academies are placed on pensions for limited periods by their respective governments.

An academy of architecture should undoubtedly possess a good and sufficient collection of books and casts, with examples of the best and most celebrated works of the ancient and modern masters, in detail as well as in models of entire structures. It therefore requires lecture, council, and professors' rooms, a museum for models, materials, and drawings, a library, galleries for the exhibition of designs, etc., with rooms for the keeper and attendants entrusted with the management and care of the

students and building.—WORNUM, *Intro. to Lectures on Painting by the Royal Academicians*, 8vo, London (Bohn), 1848.

ACAHUANA-INCA, was one of the subordinate architects employed upon the temple of the Sun at Cuzco in Peru; he therefore lived before the year 1534, in which it was destroyed. 3.

ACALUS, see CALUS.

ACANTHACEÆ. To this order belongs the genus of herbaceous plants called acanthus. The cultivated species *A. mollis*, brankursine, grows spontaneously in Sicily, Italy, and in some parts of the south of France, in shady moist places among bushes. Its leaves are large, pliant, and rather deeply divided into portions which again subdivide into little fleshy lobes; the colour is dusky green, shining above, but paler underneath. The stalk, three or four feet high, rising out of a mass of these leaves, is itself furnished towards the middle with some small ones, above which rises a beautiful head of flowers. The wild and prickly variety, *A. spinosus*, still called *ácarba* in the Morea, has a shorter stem, flowers tinged with pink instead of yellow, and darker green leaves, of which the portions are more jagged, ending in spiny points. This is the variety supposed to be preferred by the mediæval sculptors. 14.

ACANTHINE, the adjective of acanthus, is applied to draperies, borders, etc., when decorated with that ornament. 6.

ACANTHUS; the name given to a leaf employed for ornament in classic architecture. It is in general so conventional that it would have been difficult to point out the source of this particular foliage, but for the tradition preserved by VITRUVIUS, lib. iv, c. 1, respecting the appropriation by Callimachus of the acanthus. DR. SIBTHORP (*Flora Græca*, etc., fol., Lond., 1806), although giving a figure of the *A. mollis*, adds that the example was not gathered in Greece or Sicily, and describing his example of the *A. spinosus*, notes that it abounds in Northern Greece and the Archipelago. Certainly the artist must acknowledge that the general type of Greek ornament, *A*, has much affinity with the last named plant *F* (SIBTHORP, vol. vii, p. 10), while the *A. mollis*, *E*, here given from a leaf gathered on the Palatine Hill, is evidently only reconcilable to Roman art, *c* and *d*, as given by TAYLOR and CRESY (*Antiq. of Rome*, fol.,

person or thing; it has been corruptly used for the way by which the approach is made, as by a passage, road, etc.; but it should be restricted, according to the first signification, to cases like those in which headway, intermixed property, and similar difficulties occur.

ACCESS. A right of way is implied in law in cases of necessity, on the legal maxim that a right always includes *id sine quo res ipsa non potest*. It ceases with necessity, as when an owner who cannot leave his own ground without crossing his neighbour's property, acquires an access to a main road in another quarter, but may be revived and is equally implied where another access has been granted but cannot be maintained, and where the owner has inadvertently secluded his own land. The kind of road acquired (whether for carriages) would depend on the circumstances, and it is not clear what degree of inconvenience would amount to necessity. Against a grantor it would be the shortest way to the nearest high road, but probably otherwise, where it was a man's own neglect in retaining it. Similar remarks apply to access to the floor of a building, to removing timber trees, fish, tithes, etc. T. R.

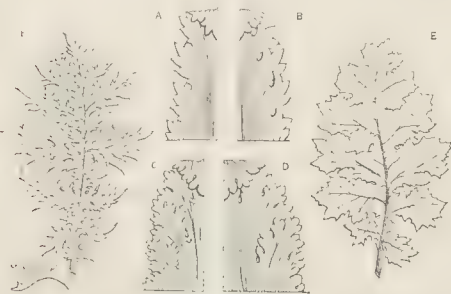
ACCESS (It. *adito*; Sp. *acceso*; Fr. *accès*; Ger. *zugang*). Passages of communication between the apartments of a building; having the same meaning as PASSAGE and CORRIDOR. 19.

ACCESSIO is a term used in the Roman law, which signifies that two things were united inseparably, one being considered the principal, the other the accession or addition to it. Sometimes it might be doubtful which was the principal, but when that was determined, its owner became owner of the accession also. Thus a tree planted in strange ground belonged, as soon as it had taken root, to the soil: and for the same reason, temporary barns or sheds are built upon STABLES to prevent the building from becoming other than tenant's fixtures. Writing on papyrus or parchment belonged to the owner of the material, but a picture painted on a stranger's tablet belonged to the artist, upon a principle that the accession was determined by the inseparable union of the accessory with the principal: but the person who lost his property by accession had, as a general rule, a right to indemnification. GIBBON, *Manual of the Law of Fixtures*, 8vo., Lond., 1836. 78.

ACCESSORY. (It. *accessorio*; Sp. *accessorio*; Fr. *accessoire*; Ger. *nebensache*.) Those features in composition which are not apparently essential either to the use or character of a building. Accessories hardly enter into the composition of the principal subject, but must have due relation to the circumstances of its style, position, and purpose, and should be used and placed in such a manner as not to hinder or spoil the effect of the principal subject, with which they ought to agree, in order to assist the general effect. ACCOMPANIMENT.

ACCIDENT, in design, is the occurrence of an unforeseen extraneous circumstance by which the merits or faults of a work may be affected during its design or execution. It may not be amiss for the architect to take advantage sometimes of accidents; to follow when they lead, and to improve them, rather than always to trust to a regular plan. REYNOLDS (*Lect. XIII*). Such unpremeditated deviations from routine are lessons, by means of which the designer improves in theory and practice.

ACCIDENT, in law, arising from culpable neglect or rashness, may involve civil or criminal liabilities. By a recent act abolishing deodands, the relatives of a party killed by such accident, are clothed with the same right to compensation as he would have had while alive. Besides the conflict of evidence as to facts, and the difficulty of estimating the degree of carelessness, nice questions arise as to the party to whom liability attaches. The broad rule is, that if the accident has occurred to an ordinary person using ordinary circumspection, a certain degree of inattention, and even in some cases intoxication, unless it were the express cause of evil, will not wholly discharge another party. A man in an improper place, as the wrong side of the road, etc., is bound to use special care, but the other party is not to be wholly reckless. In a recent case a doubt



A. Temple of Apollo D. Irmatus at M. Jettus; B. Temple of Vesta; C. Arch of Septimius Severus; D. Arch of the Golden Gate, in Rome; E. Acanthus mollis; F. Acanthus spinosus; G. Leaf of F on stem of the flower.

Lond., 1822) who also furnish the curious link *B*, which stands on the line of separation observable between the two styles. The Greek usage of the acanthus is admirable for its simplicity; but from the variations used in the schools of Roman and Italian art, not to mention Romanesque and mediæval imitations, the acanthus foliage, besides losing resemblance to the natural types and the Greek pattern, is often described as resembling that of the olive, laurel, parsley, etc.

ACAPU is the name of the best wood of South America for standing exposure to the weather; it is much used in house carpentry. 71.

ACCESS is the liberty or means of approaching a given

was suggested whether the RESPONSIBILITY extended to all the ultimate results of an accident.

With reference to the person liable, it is the actual occupier or possessor, though he merely continue a thing in the state he found it. The most difficult questions usually turn on whether the owner had parted with the control of matters to a temporary owner, to a responsible agent, or to a servant. Thus a contractor is not liable who entrusts work to subcontractors; an engineer who was superintending the erection of a boiler was held liable, but not so, it was said, if he had been absent at the time the accident occurred: on the other hand, a warehouseman was liable though he had employed a master porter, and by whose defective rope the mischief had occurred. The owner of a house who is repairing it, is liable, not the tenant. If a barge or carriage be on hire, the owner is not liable, but he must show that it was not in the charge of his servant. A master who entrusts anything to his servant is liable, though it be used beyond his orders; but if he entrust a competent man he is not liable for the man's negligence to another fellow-servant, as where an experienced foreman erects scaffolding carelessly, and a workman is injured. Surveyors, etc., officially employed are subject to the same liabilities. One party is not liable for damage done to another by an accident which is unavoidable, or caused by violence of weather, or where an injury is caused by want of ordinary care on the part of the sufferer; but the least blame on the part of the party accused, deprives him of protection.

ACCIDENTAL COLOUR. (It. *colore accidentale*; Fr. *coulour accidentelle*; Ger. *zufällige farbe*.) A colour which is not peculiar or natural to a matter or body, but produced by accidental circumstances of light, of shade, or of the atmosphere or medium through which the object is viewed. But according to an able article under this head, in the supplementary volumes of the PENNY CYCLOPÆDIA, the title of accidental colour has been given, by Buffon and since his time, to that apparent colour of which the mind acquires a perception, when the eye has been for some time directed to an object of some particular colour. **COMPLEMENTARY COLOUR.** **PSEUDOBLEPSIS.** G. R. B.

ACCIDENTAL EFFECT is a term used to imply that the effect of outline, chiar'oscuro, or colour which has been obtained, is one that results from peculiar circumstances, such as the situation of the spectator, or of the sun. **ADVENTITIOUS.**

ACCIDENTAL SHADOW expresses that the shade upon an existing building has a perfectly fortuitous origin, such as a passing cloud. **ADVENTITIOUS.**

ACCIDENTAL VANISHING POINT, in perspective: is a point where certain lines in plan or elevation, parallel to each other, but not to the principal object in the picture, converge. From the position of the part to be represented, an accidental point need not necessarily be on the horizontal line,—where most writers state it is only to be found.

ACCOLTO, see **CIONE**.

ACCOMMODATION is that well considered DISTRIBUTION of parts, which shows that attention has been paid to the purpose of the building; thus in a country house it is not sufficient to provide only for the comfort of the master and of his family; the architect has also to arrange for the convenience of the domestics, and even to be thoughtful for dumb animals. Change of manners, modes of living, public or private customs, and individual habits, influence to so great an extent the opinion upon works of architecture, that a due consideration of those circumstances is indispensable in forming a judgment upon the success of an architect in providing accommodation.

ACCOMPANIMENT. (It. *accompagnamento*; Sp. *acompanamiento*; Fr. *accompagnement*; Ger. *begleitung*.) A building or ornament having a close connexion with, or being essential to, the completeness of a design, and therefore bound by the same laws which regulate the principal. Thus the wings in Palladian villas are accompaniments, while the obelisks designed by Vanburgh for Castle Howard are mere ACCESSORIES.

ARCH. PUB. SOC.

ACCOUPLEMENT. An old term among carpenters, for a tie or brace; sometimes the entire work when framed. 2.

ACCOUPLEMENT (It. *accoppiamento*; Sp. *apareamiento*; Fr. *accouplement*; Ger. *säulenkuppelung*), or coupling, is applied to a manner of placing disengaged columns or pillars as near to each other as possible, without allowing their caps or their bases to run one into the other; a practice which has raised the severest criticism from those who adhere to precedent, as seemingly to be totally unknown in ancient art, at least scarcely a single example is correctly reported, as having been discovered; for SERLIO and his copyists have been proved by ALLASON (*Antiq. of Pola in Istria*, fol. Lond. 1817) and others, to have been wrong in their assertions with respect to its existence in the arch at Pola. In the little temple of Spoleto, the instance cited by others, there is a pillar of the peristyle close to one of the ante, which is of course not a column. Giving all possible force to the few examples brought by WOOD and DAWKINS (*Ruins of Palmyra*, fol. London, 1753) from Palmyra, it must be remarked that this authority can only be considered as an exception to the rule, in short, a LICENSE. The extension of this license, or the abuse of the system, will appear in tracing the varieties of the arrangement of columns near each other to which the term accouplement is perhaps not well applied: for instance, there is the real accouplement, scarcely ever met with in antiquity, but employed considerably in the buildings of the middle ages and of the seventeenth century, when columns were only considered as ornamental features, susceptible of arbitrary employment. In this case the base and capital of a column very nearly touch those of its neighbour, as in the colonnade of the Louvre, where they have even a common plinth. The next case is that of GEMINATED; and the third, of GROT PED columns. 25.

ACCUBITUM or **ACCUBITUS.** (Fr. *couchée*.) A couch, used in the first ages of our era, to support one person only at meals; it was made more comfortable than the **TRICLINIUM** by having softer and higher seats or cushions, while the supports, *fulcra*, were lower than those of the *triclinium*. It came to signify a room annexed to large churches, in which the clergy occasionally reposed. 78, 79, 80.

ACCUMOLI (FONTANA DA). A pupil of Carlo Fontana, erected the palazzo of the Marchese Quinzi at Aquila on the river Pescara, kingdom of Naples. 3.

ACEBEDO (GONZALO DE) worked in 1592 with another architect, Tomé di Cavano, upon the Doric saloons of the record offices at Simancas, in Old Castile. 66.

ACER is a genus comprehending the maple and sycamore; they are for the most part hardy and ornamental trees, and of quick growth:

1. *A. lævigatum*, Polished M.—Nepal and Sirmore.—35 feet.—Native buildings. (*sustendi*).—Two varieties: *A. sterculiaceum*, wood soft, and *A. oblongum*, wood good, are very large trees.
2. *A. tartaricum*, Tartarian or Russian M.—S. of Russian Asia to Hungary.—18 feet.—Fancy-work (*zarza-modon* or *locust-tree*).
3. *A. striatum*.—Canada to Georgia.—10 feet.—White; by natives for inlaying.
4. *A. campestre*, Common M.—Europe.—The English M. used for upholstery and frames. Turns well. In Tuscany (*loppo*) used as timber.
5. *A. pseudo-platanus*, Sycamore M. (*Plane tree*), many var.—M. and S. Europe.—50 feet.—Coarse work, where lightness and toughness are required; brownish white or yellowish color; turnery, bread-plates, upholstery, etc. Tuscany (*acero fico*) as timber.
6. *A. macrophyllum*, Broad-leaved M.—N. W. of N. America.—Large.—Great value, scarcely inferior in grain to finest satin wood; veneering.
7. *A. platanoides*, Norway M.—N. and Mid. of Europe and N. Asia.—Turnery.
8. *A. saccharinum*, Sugar M.—Canada to Up. Virginia.—80 feet.—Hard and satiny lustre; readily attacked by insects; but when its grain is waved it is in request for upholstery.
9. *A. nigrum*, Black Sugar M., a variety.
10. *A. ericarpum*, Sir Charles Wager's M. (*White M.*)—E. of N. America.—Light; turnery.
11. *A. rubrum*, Scarlet M. (*A. coccineum* and *A. intermedium* are var.)—Canada to Florida.—Tough; more valuable than 10, being used by natives for furniture, and stocks of rifles.

D

12. *A. negundo*, Ash-leaved M.—Upper Canada.—Furniture. In Tuscany (*negundo*), furniture and timber.

They will all grow well in England. 3, in very favourable situations and cultivated, exceeds twenty feet in height; the thickness of the shade, beauty of the bark, and the tree not being liable to insects, render it very desirable for plantations, where it is remarkable for the bright rosy tints of its young leaves, and for its shiny red boughs in winter. 4 is superior to beech and sycamore for turnery, and substituted for that of holly and box by mathematical instrument makers. 5 is durable when dry, and escapes the worm, to which it is as liable as beech; polishes, and does not easily warp; arrives at greatest perfection in Italy, and has a striking effect whether as a single tree, planted in avenues, or in masses; it thrives near the sea and in the smoke of London. WARE (*Body of Arch.*, fol., Lond., 1767, 1, 21) says "there are old houses in this country floored with sycamore and wainscotted with poplar: the wainscot has never been painted, but retains a good colour, and floors stand excellently and are very pretty." 6 is the finest species of the genus, forming a large tree; some of the leaves have measured 10 inches diameter. It yields the bird's-eye maple of commerce: the native wheelwrights employ it after a seasoning of three years; and when constantly under water it will not readily perish. 7, in Russia, passes from the state of a shrub in the northern part, to that of a handsome tree in the southern districts, and is cultivated for its glossy deep green leaves. It is one of the best trees for sheltering habitations. 8, in England, rarely exceeds 16 feet; in autumn the woods are dyed of a crimson hue by its changing leaves. 9 is one of the most ornamental of the genus, and its leaves change as 8. 10 is one of the first trees in England that put forth their blossoms in the spring.

14, 71.

ACERATE OF LIME, a salt produced by the evaporation of acetic acid, having its basis lime; it has a weak acidulous taste, and the atmospheric air having no effect upon it, it is found even after long exposure, to retain its colour, white; it is also found not to interfere with colours, although the acid is combined in very small proportions, say 12 parts to 1000 of water. This property renders it available for external works or decorations; the preservation of many of the frescoes now so perfect, may be attributed to its presence; it being found in the plaster of the frescoes at Pompeii, and having been used with success for some years at Rome; the colours appearing still very perfect.

W. H.

ACERENZA, or CIRENZA, anciently Acherontia, is an archiepiscopal city, in the province called Basilicate, of the kingdom of Naples. It has a cathedral, one of the oldest and finest in Italy, and also one of the richest in ornaments, a castle, two convents, a grammar school, and a hospital.

ACERIC ACID is the acid procured from the sap of the common maple, *acer campestre*, named by Professor Scherer of Vienna; Gmelin however says that it is merely malic acid; it has a milky aspect, and a sweetish taste; its specific gravity varies. It does not alter litmus or turmeric paper; it is precipitated by oxalate of potash, nitrate of silver, and barytes water, but not by muriate of barytes. When boiled, it lets fall gluten in flocks; it yields, when evaporated with lime, a salt with bases of lime called the ACERATE OF LIME.

W. H.

ACERNO, in the province of Naples called Principate Citra, is the see of a bishop, and has therefore a cathedral besides its parish church.

ACERO (EL MAESTRO-MAYOR DON VICENTE) made the designs and laid the first stone for the new cathedral at Cádiz, 14th January 1722. Although his style was immediately disapproved, he designed in 1724 the cathedral at Málaga. Quitting that city, he was employed until his death to finish the Royal tobacco factory in Seville.

66.

ACERRA, in later times ACERIS. The casket which held incense in readiness for the supply of the altar or censer. An example of its shape is given from a sculpture, in the hands of



attendants, on the column of Trajan. The *acerra* was also, according to FESTUS (s. v.) a censer like an altar on which perfumes were daily burnt before a corpse till buried. Both descriptions are found sculptured on friezes.

79.

ACERRA, in the province of Naples, called Terra di Lavoro, is an episcopal city, with a cathedral and a *seminarium*.

ACESTIDES. The chimneys of furnaces where brass was made, were thus called; they were contrived to be narrow at top, on purpose to receive and collect the fumes of the melting metal, in order that CADMIA might be produced in greater quantities.

13.

ACETATE. The compound formed by the action of ACETIC ACID with the salifiable bases; the acetates are divided into metallic and non-metallic. The metallic acetates which have been analysed are seven, viz., silver, nickel, copper, lead, iron, zinc, and manganese. But the oxides formed when in contact with other metals may also be termed acetates of such metals. The non-metallic acetates are the earths and minerals, in combination with acetic acid, as barytes, strontites, lime, magnesia, silice, alumine, zircon, glucine, and yttria. All the acetates are decomposed by heat, and they are found to act as preservatives of many materials.

W. H.

ACHELOR, ACHLER, ACHLERE, old terms for ASHLER.

ACHICOLUM, see ARCHITHOLUS. (SUDATORIUM.)

13.

ACHIEVEMENT expresses the collected armorial ensigns of any person; and it consists of the shield or arms, supporters if any, helm, wreath or torse, crest and word, with mantles and motto, which by heralds is shortly called the blazon, helm, and timbre: to which may be added in some cases the badge or cognizance; these are in general sufficient to furnish the artist with subjects for decoration appropriate to the edifice upon which he is employed.

ACHLEITNER (SIMON) was master of the works at S. Stephen's in Vienna about 1481.

26.

ACHMIN, AKHMIM, or ECHMIM, the modern name of CHEMMIS or PANOPOLIS.

ACHMOUNEIN or ESHMOONAYN, the modern name of HERMOPOLIS MAGNA.

ACHRAS, a genus of tropical plants belonging to the natural order Sapotæ. *A. balata* (called *balata* or *valata*), and a variety (*acoma* or *mastic*), produce a timber, which in Trinidad is held in high estimation, and therefore extensively used. It varies in diameter from 2 to 4 feet.

71.


ACHROMATIC, meaning literally without colour, is applied in decoration to imply total absence of colour: mere white and black, or white and gold, may be considered achromatic in this sense.

ACID. The term as applied by chemists is generally defined to be a compound, which is capable of uniting in definite proportion with alkaline bases, and which when liquid or in a state of solution has either a sour taste or reddens litmus paper. Chemical knowledge has given as yet no better definition of this term, which has generally been supposed to denote a substance having a sour taste, reddens vegetable blues, and neutralizes alkalies. This is not quite correct; for although all the more powerful acids possess these properties, many known acids are deficient in some of them: insoluble acids have no taste, and do not reddens litmus paper, and carbonic acid does not destroy the characteristic properties of alkalies. Although it is admitted that both oxygen and hydrogen can communicate acid properties to certain bases, it is now generally admitted that no substance can be yet considered as the acidifying principle.

In acting upon vegetable colours, most acids change blue-coloured infusions red, and heighten the colour of those that are red. But this property is not common to all acids, for some, like volatile sulphureous acid, destroy these and other colours. The action is perceived in the change of colour produced in paper-hangings. Papers stained with acids become

tests of the presence of uncombined acids. Acids combine chemically with alkalies, earths, and metallic oxides, and are also tests of the combination of rocks; thus sulphuric acid acts on limestone, iron, and the different earths: carbonic acid decomposes lime: silicic acid is produced from siliceous earths and flinty stones, and renders those with which it may be combined subject to decomposition; water has no action on the powder produced, which is pulverized rock crystal.

The action of acids upon the materials used in building is a study worthy of the attention of the architect. The separation of the parts of which rocks and metals are formed by the action of acids, whether that action be by direct contact with the particular acid, or by the influence of an acid absorbed from the atmosphere, is equally injurious and deserving of note: and a test will be serviceable, to show quickly this action, which may be observed without waiting for time, and to cause prevention through an opposing agent.—**DECOMPOSITION.** W. H.

ACISCULUS, a small PICK, used chiefly by masons, having one end like that of a hammer, and the other pointed; whence in ancient glossaries *aciscularius* is translated *λατομος*, a stone-cutter.  79.

ACNA or **ACNUA**, also spelt **AGNA** or **AGNUA**, the Latin term for **ACTUS** quadratus or 14,400 square feet. 78.

ACONCAGUA, the capital of the province of the same name in Chili, is a city laid out in form of a square, surrounded by extensive **ALAMEDAS**, which are planted with Lombardy poplars. The centre of the town is a large square, occupied on one side by the church and barracks, opposite to which are the town-hall and other municipal buildings; the remaining two sides are composed of private dwellings and shops, which are of one story only and without fireplaces, braziers being the only method of warming employed. 50.

ACORN, the English name for the fruit or seed of the oak. Imitations of it are much used in architecture, and it is sometimes introduced in lieu of the egg in the Roman *ovolo*.

ACORUS CALAMUS, Sweetflag, is the only native aromatic plant of northern climates. In many counties of England, in which the plant abounds, it was formerly used to strew the floors of houses instead of rushes; a purpose for which its fragrant leaves made it very suitable. The practice is said to be still maintained in some places. 14.

ACOSTA (**CAVETANO**), a Portuguese architect and sculptor, constructed, in 1770, the retablo-mayor in the sagrario of the college at Seville. 66.

ACOMETER, an instrument invented by Itard for estimating the extent of the sense of hearing. 48.

ACOUSTICS. (Gr. *ἀκουειν*; It. *teoria di suoni*; Sp. *acustica*; Fr. *acoustique*; Ger. *akustik*.) The present theory of acoustics, or the science of sound, may be stated briefly as follows. It comprises the explanation of the phenomena relating to movements of the air, occasioned by impulses more or less violent, whence the effect, denominated sound, ensues. Every sound requires the existence of some medium; for a bell agitated under the exhausted receiver of an air-pump hardly emits any sound. The impulse given to air is transmitted in every direction, in waves decreasing in intensity in proportion to the particular elasticity of the medium, and the distance through which it is transmitted, like those produced by a stone thrown into a pool of still water; all waves of the same musical sound are of precisely similar character, and they are separated by equal intervals in equal times. The intensity of the sound depends upon the violence, and the extent, of the initial vibrations of the air; the molecules of the latter and the vibrations being themselves very small, whilst the waves of sound vary from some inches to several feet in length. Sounds become musical when the vibrations are not less than thirty nor more than two thousand per second. Grave sounds are produced by very slow vibrations; the sound becomes more and more sharp in proportion as these increase in rapidity.

The velocity of the transmission of sound, according to ARCH. PUB. SOC.

LAPLACE, is uniform, and independent of its nature, or of the intensity of the initial impulsion; but it depends upon the elasticity of the medium through which it is transmitted, and is consequently greater in summer than in winter, under the normal conditions of pressure. At the same temperature, the elastic forces of two different strata are as their densities, that is, for air of half the density of common air the elastic force is only half as great; and so on. Any increase of temperature increases the elastic force of the air, if the density remain the same; compression always increases the temperature, and *vice versa*. In dry air, at a temperature of about 32° Far., the rate of propagation is about 1089 feet per second: at 62° its speed is 1125 feet per second according to **HERSCHEL**. Every increase or decrease of temperature of one degree Far. causes a corresponding increase or decrease of $1\frac{1}{100}$ of a foot in the velocity of sound. Any interference with the homogeneity of the atmosphere, such as falling snow, rain, etc., retards the transmission of sound. **HUMBOLDT** attributed the fact that sounds are heard at greater distances by night than by day to the differences in the density of the atmosphere produced by the variable temperature during the latter. Water transmits sound more rapidly than air, and it is stated to travel in that medium with a velocity of 4,708 feet per second; and it has been ascertained that it is transmitted through iron, glass, and some sorts of wood, at the rate of 18,530 feet per second. Gases of the same pressure and temperature convey sound with velocities which are inversely as their densities, that is, air being about thirteen times as heavy as hydrogen, the velocity of propagation in the latter is about thirteen times that in the former. The equality in the transmission of sounds in every direction depends upon the homogeneity of the medium in which it is excited, and the absence of any initial velocity in one direction; conditions which rarely obtain in practice.

The intensity of sound depends upon the absolute velocity of the particles impelled, and not upon the velocity of propagation, which is found to be the same for all sounds. The greater the velocity of the particles impelled, the louder is the sound without any difference of character, pitch, or velocity of propagation. When once formed, the sonorous undulations are transmitted directly, and they only return upon their course when reflected by some extraneous object. They are reflected in a manner peculiar to themselves, namely, in waves parallel to the surface on which they impinge, when that surface is within the angle of 45° of the point from which the sound is emitted; and in waves moving at right-angles to that surface, beyond the angle of 45°. Should the reflecting surface be concave towards a person, the sound will converge towards him with increased intensity, which will be greater still if the surface be equal and concentric with him. Undulations of sound diverging from one focus of an elliptical shell converge in the other after reflection. Consequently a sound from the one will be heard in the other, as if it were close to the ear.

The reflection of sound from surfaces is affected by their qualities of rigidity and elasticity to a very important extent. Thus, the reflection from a rigid substance like marble is most distinct and powerful; that from an elastic surface, as glass, metal, or wood, is most subject to resonance; while that from yielding substances, as woollen cloths, is indistinct and feeble: these last are familiarly termed absorbents of sound. When a sound is promulgated from a definite centre, as from an instrument, or from a human being, it proceeds furthest and most distinctly in the direction towards which it was addressed. In the construction of rooms, or halls for the purpose of musical entertainments, it follows from what has been said above, that those forms should be adopted in which the reflected waves of sound shall naturally coincide with the force and direction of the initial vibrations, in such a manner that their regular and harmonic recurrence may not be prevented. In rooms for the purpose of discussion, any large masses of air above, or around, the speaker, which it would become necessary for him to set

in vibration, should be avoided. There is, however, so little known upon the practical application of the principles of acoustical science, either with respect to the form most adapted to the conveyance of sound, or to the influence of certain materials upon its reflection or absorption, that it is impossible to lay down any general laws upon either branch of the subject. In the present age, although so many halls for legislative assemblies, so many theatres, concert rooms, and churches, have been constructed, no attempts have been made with success to reduce the theory of acoustics to practice. The knowledge on this subject is still as purely empirical as it was in the time of Sir C. Wren; and, indeed, it must be remarked, that the churches built by him are even now the instances in which the practical difficulties of the case have been overcome in the most satisfactory manner.—CHLADNI, *Acoustique*, 8vo., Paris, 1809, and 4to., Leipzig, 1830; BIOT, *Traité de Physique*, 8vo., Paris, 1816; SAYART, a series of memoirs in the *Annales de Physique et de Chimie*, 1810-27; POISSON, a memoir in the transactions of the *Académie des Sciences*, "sur la propagation du mouvement dans les milieux élastiques", 1831, and other papers; LACHEZ, *Acoustique et Optique des Salles et Réunions Publiques*, etc., 8vo., Paris, 1848; SOMERVILLE, *Connection of the Physical Sciences*, 8vo., Lond., 1836; SIR J. HERSCHEL, "Sound," in *Ency. Metrop.*; INMAN, *Ventilation and Sound*, 8vo., Lond., 1836; Reports of Committees of House of Commons, *Ventilation and Sound*; WYATT, *Observations on Design for a Theatre*, 4to., Lond., 1812; SAUNDERS, *Treatise on Theatres*, 4to., Lond., 1790; WHEATSTONE, *Annals of Philosophy*, 1823; *Quarterly Journal of Science*, and *Journal of the Royal Institution*, from 1827 to 1831; *Report of the British Association*, 1832; and *Philosophical Transactions*, 1833; BERNOULLI, various papers in the *Memoirs of the Academies of S. Petersburg and Berlin*, from 1800; *Builder Journal*, vol. viii, 1850. (See *Detached Essay*.) G. R. B.

ACQUAPENDENTE (Aquila, Aquæ Taurinæ), a city of Italy, in the legation of Viterbo (State of the Church), to which the episcopal seat was removed from CASTRO in 1647. It possesses five churches and the cathedral. 28.

ACQUI (AQUÆ STATIELLÆ), a city in Piedmont, contains besides four arches of an aqueduct, thermæ, and other Roman remains, a duomo begun in the twelfth century, with five aisles; two other churches, some convents, a royal college, *seminarium*, town hall, and other remarkable buildings. The church of S. Francisco, a Gothic building, scarcely inferior to the cathedral, was reduced to ruins during the French invasion. 28.

ACRADINA (Gr. ἀκράδινα), a district of SYRACUSE.

ACRÆ, a town built by the Syracusans about 665 B.C. and now represented by ruins at Acramonte, near Palazzolo, in the south of Sicily. The city once contained temples to Ceres, Diana, Proserpine, and Venus; at present a fine cistern, theatre, and odeum, are the principal remains. The latter was perhaps the first discovered example of the Greek odeum; its orchestra was about 19 ft. in diameter, and there were five rows of seats, divided into three CUNEI by two staircases. The orchestra of the THEATRE was about 64 ft. 6 ins. in diameter; and, besides those which may have been on the hill, twelve rows of seats were in the excavated rock, which were divided into nine cunei by eight staircases. Remains still exist of the pulpitum and proscenium, and of the scena, which had doors into the orchestra. They are given, with various fragments, such as a stele with Doric frieze and dentilated cornice, by SERRADIFALCO, *Antichità di Sicilia*, fol. Palermo, 1842; and No. 7 of the MUSEUM OF CLASSICAL ANTIQUITIES, 8vo, Lond. 1852.

ACRAGAS (Gr. ἀκράγας), one of the ancient names of AGRIGENTUM.

ACRE, or S. JEAN D'ACRE, a town on the sea-coast of Syria, represents the ancient Acco, afterwards called Ptolemais. The town, chiefly consisting of stone dwellings with flat roofs, arranged in streets so narrow that it is said no animal can pass a camel in the principal thoroughfares, is only furnished with

one gate. It was for some time in the possession of the Crusaders, who fortified it, and filled it with churches. After the sieges of 1799 and 1832, it contained a Greek and an Armenian church; a synagogue; two bazaars; three khans; baths (of which the principal one was thought to be better built and much finer than any other in the Turkish empire); fountains (especially, near the pacha's palace, a superb one of white marble from the ruins of the neighbouring Cæsarea, and another of various marbles, placed by Daher in a hall in one of the towers); the scraglio, granary, and arsenal; and a mosque with an elegant dome, built by Djezzar Pacha, the successor of that Sheik Daher ben Omar, who, in the middle of the eighteenth century, strengthened the town and revived its commerce. There are no authentic accounts as yet of the damage done to the town by the bombardment of 1840.

ACRE, a measure of land, equal to ten square CHAINS; a square mile contains 640 such acres. The statute 31 Henry VIII, declares that 160 PERCHES make an acre; and the ordinance of measuring land, 35 Edward I, agrees therewith. The imperial or standard English acre, or, as it is usually called, the statute acre (also used in the United States), is divided as follows:—

Acre.	Rood.	Perch.	Square Yards.	Side of square, equivalent to perch in yards.
1 =	4 =	160 =	4,840 =	69.5701
	1 =	40 =	1,210 =	34.7851
		1 =	30½ =	5.5

Previously to the introduction of the new system of weights and measures by the act 5 George IV, c. 74, the local acre varied in different counties of England. That of Devon, Somerset, and Derby equalled 5 yards to the perch or pole; that of Cornwall, 6; that of Lancashire, 7; that of Chester and Stafford, 8; whilst that of Wiltshire was only 4½ yards. 48 Scottish acres were equal to 61 English; and 121 Irish acres are equal to 196 English ones, although the proportion is commonly put as 100 to 162. By a statute of 31 Elizabeth, it was necessary that if any man erected a new cottage, he must add four acres of land to it. The Strasburgh acre is about half an English acre. The term was formerly used in France, where its extent varied in different provinces. The acre of Normandy had 160 perches; and in an old register, it is written that 24 feet make one *perche*, 40 perches one *verge*, 2 verges an *arpent*, and 4 verges an *acre*. As this gives the Cheshire pole, the Norman and English foot must clearly have once been alike. Further reference may be made to KELLY's *Cambist*. 45.

ACREME, a term sometimes used in ancient law books for ten acres. 13.

ACROASTS (Gr. ἀκροασίς). A lecture, as used instead of acroama by VITRUVIUS, x, 22, where he states that the architect CALLIAS, on arriving at Rhodes, "acroasim fecit exemplumque protulit"; i.e. gave lectures on fortification, illustrated by models.

ACROATERION (Gr. ἀκροατήριον), a hall or place where lectures were read, or discourses pronounced by teachers, *PLUT. de Aud.*; the word has been also rendered by *suggestum*, and by *pulpitum*. Acroasis also meant the same place, *PLUT. de discern. Amico.*, and sometimes perhaps the audience itself, *CICERO. Ep. ad Att.*, 19, 15.

ACROBATICON (Gr. ἀκροβατικόν), the Greek term for scaffolding, called in Latin SCANSORIVM.—VITR. x, 1.

ACROCOMIA SCLEROCARPA (gru gru) is the name of the wood of a palm tree, native of Trinidad, yielding beautiful veneers. 71.

ACROCORINTHUS (Gr. ἀκροκορινθός), is a rock about 2,000 feet above the level of the sea, which formed the ACROPOLIS of CORINTH, and on which the inhabitants of that city placed their citadel, and the celebrated temple of Venus. 50.

ACROLITHUS (Gr. ἀκρόλιθος). The word is used by VITRUVIUS, ii, 8, in a manner which must leave an impression that it might imply "a top stone", or crowning ornament. It is an epithet which lexicographers agree with WINKELMANN, *Hist. Art.* i, 2, to consider as implying a statue of which the face, feet, and hands, or toes and fingers, were of marble only,

and the rest of the figure of baser material, either gilt, or more usually covered with drapery. Statues of this kind were made in Greece at least down to B.C. 350; such images of Bacchus, Venus, and Priapus, were found in the adytum of Isis at Pompeii. TREBELLIIUS POLLIO, in xxx *Tyrann.*, 32, speaks of a gilt acrolithic statue, erected about A.D. 270, to a priestess Calphurnia, in the temple of Venus at Rome. PAUSANIAS mentions, in eight places, works of mixed wood and marble; but only twice (vi, 25, ix, 4), describes the gilding, and only once (vi, 25) positively says that the marble in that instance was not gilt.—POLYCHROMY. 6, 78.

ACROPODIUM was perhaps the technical term for the base worked below the feet of a statue. The word is found in HYGINUS, *Fab.* 88, who says, "gladium de vagina ei extraxit Pelopia et rediens in templo sub acropodio Minervæ abscondit", which may only infer that the heroine of his story concealed a sword under the plinth of a statue; but it probably means that she concealed herself in the ADYTUM, passing to it through a door in the pedestal of the statue.

ACROPOLIS (Gr. ἀκρόπολις). The stronghold, or citadel, built on the highest part of the elevation on which almost every Greek city was placed. It corresponded with the Roman term *arx*, and with the Capitolium of Rome. The most famous were those of Athens, of Corinth (called ACROCORINTHUS), and of Messene, called Ithome. A general description of the arrangement and styles of these Greek citadels is given by STUART. *Dict. s. v.* Such strongholds generally held the chief treasury and archives, and a temple or chapel for the celebration of religious rites. CASTLE. CITADEL. KEEP.

ACROSTIC (Gr. ἀκροστιχίς). A suitable name for what seems to be a sculptural arrangement in place of ornament. Sometimes the assemblage of objects in the hollow mouldings of mediæval cornices, had some such meaning as the Tiger, Heart, Ostrich, Mermaid, Ass, and Swan, placed over the kitchen chimney at Kingswood abbey in Wiltshire, of which the initials show the name Thomas. PARSONS (*MS. in Bib. Bodl.* f. 91.)

ACROTIERIUM. (Gr. ἀκρότριον; It. *acrotéria*; Sp. *acrotérie*; Fr. *acrotère*; Ger. *giebelzinne*.) The term appears to have signified in classic times an extremity, generally elevated, and to have been used originally in the same sense as FASTIGIUM (namely, for the sloping roof of a building), and more particularly for the ornamental front or gable of such a roof, *i. e.*, the pediment. The word in old writers is sometimes used for the ornaments placed on the pedestals on a pediment, but it is strictly applicable only to the pedestal itself, placed to receive a statue, vase, or other ornament, VITRUVIUS, III, 3. See L'EVEILLÉ, on PEDIMENTS. Thence it was applied to all similar decorations of altars, stelæ, etc. According to BATISSIER, *Histoire de l'Art Monumental*, 8vo, Paris, 1845, the ornaments themselves were called acroteria if they had no plinths; he also mentions that the term is used by the French for the cross or knob placed at the top of a gable. The word has been applied, moreover, to the small plain surfaces in balustrades, between the pedestal and the balusters (half die); and to the pinnacles or other ornaments which stand in ranges on the horizontal copings or parapets of buildings. 2, 78.

ACSA, the modern name for THYATIRA.

ACTINISM. (Gr. ἄκτιν. Fr. Ger. and It. *Actinisme*.) The chemical power of the sun's rays. The laws which regulate the action of this property are not yet distinctly ascertained; but it is known that it does not coincide with the other properties of those rays which produce light and heat: for if they be decomposed by passing through a prism, the maximum intensity of heat will be found at the bottom, a little below the extreme red; the maximum intensity of light will be found near the centre of the spectrum, and in the yellow; whilst the maximum intensity of the chemical power, or actinism, will be found near the top, and in the violet. Actinism differs also from the light and heat of the sun's rays in this, that after declining from its maximum in the violet to its minimum in the yellow, at a point coinciding

with the maximum intensity of the light, it rises again to what may be called a second culminating point in the red; whereas both the powers of light and heat are susceptible of only one series of gradations. The chemical power of the sun's rays is the principal agent in photographic, or more correctly, heliotypic pictures; and is one of the most serious questions discussed at present in the choice of glass. The influence of this quality upon vegetable life, as in conservatories, and upon the occupants and furniture of dwellings, is beginning to be fully recognized. G. R. B.

ACTUS. In the Roman system this term seems to express both a single furrow (or 120 Roman feet, which was twelve times the standard rod of ten feet) as a measure of length; and the path (four feet wide) reserved for the passage of cattle between fields, which was combined with this length to form a measure of superficies: this last was the actus minimus or simplex, being equal to the *sextans*, or sixth part of the *jugerum*. The actus quadratus, or major, contained 14,400 square feet, or 144 *scripula*, and was the *semis*, or half of the *jugerum*. VERSUS. 78.

ACURIOLA (FRANCISCO), erected many good edifices in Andalusia, he constructed in 1585 an elegant gateway at Antequera. 66.

ADALIA, otherwise SATALAYA or SATALIEH, anciently called ATTALIA, is a seaport in Anatolia, remarkable for the streets being built on a natural amphitheatre, and ranged like the seats in an artificial one. Many relics of ancient buildings exist, and those which have been used in modern buildings have been employed with much care and consideration. 50.

ADAM (WILLIAM), of Maryburgh near Kinross, and Kirkaldie, father of the four brothers hereafter mentioned, must have died before 1760, for in WOOLFE and GANDON, (*Vit. Brit.*, vol. v, pl. 58, 59, 60), the body of Duff House is said to have been designed by the late Mr. Adam; and it is supposed that in the VITRUVIUS SCOTICUS, (which, although published in parts at various times, from 1720 to 1740, did not appear in a collected form until the year 1810,) G. or Gul. Adam, inv. & del. or del., means the parent of the Adelphi brothers, from the evidence of the style of design, the mode of execution, and the signature to the plate of that particular house. The first notice of this architect appears in 1732, when he made a general map of part of the river Spey (*Brit. Mus. Bib. Reg.* xlviii, 78); and in 1746 he submitted a plan of Edinburgh Castle, with a project for extensive new outworks at the entrance (*B. M. Bib. Reg.* xlix, 71). Besides the works hereafter attributed to his son JOHN, in conjunction with him, he appears to have designed Airth, Balggregan, Belhaven, Broomlands, Callie (altered, enlarged, and re-decorated by the late J. B. Papworth), Cammo, Cumbernauld, Duff, Dun, Ely, Faskie, Gartmore, Haddo, Hamilton Hall, Hamilton, Lessly, Longfarnham, Mountstewart, Mavisbank, Newhall, Niddrie, Preston Hall, Somerville, Saughton, Taymouth, Tindwall, Torrance, and Yester Houses; the buildings of Arniston, Belvidere (Dalrymple), Buchanan, Craigdarroch, Lawers, Lonmay, Newliston, and Tulliebardin; the temples at Castle Kennedy and Eglinton, the Town House at Dundee, the Royal infirmary, Watson's and the Orphan's hospitals at Edinburgh; the new library and university at Glasgow; the kennel and church at Hamilton; the new east front and wings of Hoptone House (conf. *Vit. Brit.*, vol. ii, pl. 75); Castle Kenmure, and Fleurs Castle. He was appointed master mason in Scotland, and in that character he commenced, in 1751, the re-building of Fort George, destroyed by the Pretender in 1745. G. B.

ADAM (JOHN), of Edinburgh, eldest son of the above WILLIAM ADAM, was successor in his office, and in that character finished, about 1763, the re-building of Fort George. Besides the edifices specially assigned to him in the VITRUVIUS SCOTICUS, as a Gothic bridge at the mouth of the River Aray, and Lord Alenmore's villa at Hawkhill, near Edinburgh, it may be fairly inferred that he had a share in the works attributed to

the Adams in that book, viz., Ballochmyle and Dumfries Houses, Douglas Castle, a house for Lord Milton, in Edinburgh, and another for J. McCulloch, Esq., of Barholm. G. B.

ADAM (ROBERT) F.R.S., F.S.A., was the second son of the same WILLIAM. He and his brother JAMES, were the most celebrated architects of the name; but the leading position seems to have been taken by ROBERT, who was born at Kirkcaldie, in Fifeshire, on the 3rd of July 1728; he died from the bursting of a blood-vessel, 3rd March 1792, and was buried in Westminster Abbey, where a slab in the south transept records the above dates. He was educated at the University of Edinburgh, and one of his earliest productions in the arts, dated 1744, is contained among the *Original Sketches* in Sir John Soane's Museum; wherein is also to be found the record of his visit to Nismes, 13th Dec. 1754; to Porto Fino, 18th Jan. 1755; and to Rome, 1756, where he made the magnificent drawings for a royal palace and other buildings in vol. i. of the collection in the same museum, of the drawings of these brothers. He sailed from Venice, 11th July, 1757, and arrived with Clerisseau and two expert draughtsmen, 22nd July, at Spalatro, where they remained five weeks, actively engaged in making accurate drawings of the ancient palace, and the buildings connected therewith. The Soane Museum contains, in vol. ix* of *Drawings by R. and J. Adam*, among sundry designs for bridges, a note, "done since my return to England in 1758," and designs for circular towers, temples, garden-seats, etc., dated 1759; a building which may be contrived to answer for the fireworks at a general peace, dated 1759, and a garden building, 1760. The screen in front of the Admiralty dates from this year, and about this time he seems to have begun his career of practice, which he subsequently pursued in conjunction with his brother JAMES. Shardelee, in Buckinghamshire, was in existence in 1759, and the wings were built in 1761; and he is himself the authority for dating the works at Sion in 1761-62. In vol. ii are drawings for Lord Coventry's greenhouse at Croome, in 1760; in vol. i the design for a mausoleum at Bowood, 1761; and in vol. xiii that for Kedleston (*Vit. Brit.*, vol. iv, pl. 45-51), built for Lord Scarsdale, dated 1761; the front was finished in 1765, but the wings were not added in 1767. There seems every reason to believe that a work of this period was Lansdowne House (*Vit. Brit.*, vol. v, pl. 9 and 10), on the south side of Berkeley-square, built for Lord Bute, and sold to Lord Shelburne, afterwards Marquis of Lansdowne, for £22,000, which was supposed to be less by £3,000 than its cost.

During this time he published *Ruins of the Palace of the Emperor Diocletian at Spalatro, in Dalmatia*: fol., Lond. 1764; this book was followed by the erection of Kenwood, or Caenwood, for Lord Mansfield, 1764-7; the entrance gateway to Sion House in 1766, and to Shelburne House in 1767; Luton House for Lord Bute, 1767; the Adelphi begun, 1768; and the Deputy-Ranger's Lodge in the Green Park, built in 1768 (pulled down 1841); for he had early been appointed architect to the King and Queen, which post he resigned this year, on being elected member of Parliament for the county of Kinross. Mansfield-street, Portland-place, built about 1770, contains ample specimens of the skill of the brothers in interior decoration, while one of their best exteriors, executed at the same time, is the British Coffee-house in Cockspur-street. Some other works are here placed in chronological order:—1771, an elevation for Lord Temple at Stowe; 1772, a garden seat for the Duke of Montagu at Richmond; 1773, Sir W. Wynne's in St. James's-square; gateway and lodge of Ashburnham House, Dover-street; 1774, pavilion for the Earl of Derby, at the Oaks, in Surrey; the Register Office at Edinburgh; 1775, Drury Lane theatre; 1776, Mistley church, in Essex; a house for Mr. Aislabie, at Hendon; another for Mrs. St. John near Welwyn in Hertfordshire; and the fronts of Roxburgh (now Harewood) House, at the S.E. corner of Harewood-place, Hanover-square, which the original drawings state was to be covered with "Liardet." For some time subsequently to this

period, the brothers appear to have been at the height of their employment; Portland-place was begun about 1778, and that year they published a book, which had been commenced in numbers since 1773; viz., *The Works in Architecture of Robert and James Adam*, 2 vols., Eng. and Fr., fol. (followed in 1822 by a very meagre supplementary volume). They were the virtual plaintiffs in the celebrated cause which has decided so many trials respecting patents—*Liardet v. Johnson*—which provoked a large amount of bitterness, and is well discussed in two pamphlets: 1. *Observations on two Trials at Law respecting Messrs. Adam's new-invented Patent Stucco*; 8vo. Lond. 1778; and 2. *A Reply to Observations on two Trials at Law, etc.*, 8vo. Lond. 1778.

The British Museum, as well as the collection above named, contains designs for entrances to London at Hyde Park corner, dated 1778 (*Bib. Reg.* xxvii, 26, a, b, c). The works of the infirmary at Glasgow, and some extensive new buildings in Edinburgh university, seem to have mainly occupied the attention of the brothers until 1787, when they gave designs for White's Club in St. James's-street, a house called Newliston, and for additions to Yester House, in East Lothian. In June, 1790, they began the east and south sides of Fitzroy-square. At the time of his death the improvements at Edinburgh were unfinished. In the *Vit. Brit.* vol. v, are the designs for Witham, Co. Somerset, for Mr. Beckford (pl. 38-42), and Compton, Co. Warwick, for Lord Willoughby de Broke (pl. 53). It also mentions that Harewood House, co. York, (built by Carr), received its interior decorations from their hands. Vol. vi (*Soane Mus.*) contains the representation of Gossford House, in East Lothian (*New Vit. Brit.* vol. i, pl. 43-50), one of their last and best works. Their skill in tombs may be judged from those of the Duchess of Northumberland, the poet Thomson, Major André, and Colonel Townsend, in Westminster Abbey. Many of the works of these architects were executed by the brothers as speculative builders. They may be recognized in Stratford-place and Grafton-street, (Bond-street), and in nearly all the new London of that period, extending from Hanover-square to Park-lane and the Edgware-road; indeed, the names and relationship of the four brothers, John, Robert, James, and William, and the family name, are preserved in the names of the streets in the Adelphi, and by the Adam-streets near Portman-square. G. B.

The taste of the brothers ADAM was evidently the result of an earnest study of the antique, although not of the highest class of ancient monuments. Their buildings never attain the dignity of monumental edifices, but they display a lively imagination, and in plan much graceful playfulness, of which a most happy instance exists in their design for the pavilion erected for a fête champêtre at the Oaks, Surrey, the seat of the Earl of Derby, 9 June 1774. Their orders are deficient in impressiveness, and their ornamentation was meagre, as though founded on the frescoes of the baths of Titus; but yet by no means deficient in the intention to produce richness. Robert Adam was an intimate friend of Piranesi, who dedicated to him a volume of the *Magnificenza*, in terms of high praise. The work on the palace of Spalatro evinces considerable merit, and the treatment of the subjects, whether as to the selection of the points of view, grouping, or chiaroscuro, is vigorous and characteristic, nobly seconded by the bold and mellow burin of Bartolozzi, a rival worthy of the genius of his cotemporary Piranesi. T. L. D.

ADAM (JAMES), likewise a son of the WILLIAM above named, died in an apoplectic fit at his residence, 13, Albemarle-street, London, 20th Nov. 1794.—*GENT. MAG.* vol. lxiv, p. 2. Some of his earliest productions, dated 1751 and 1752, are in vol. vii* of *Drawings by R. and J. Adam*, in the Soane Museum, which also contains designs for a small house for Capt. Hugh Dalrymple, and a gateway for the Duke of Argyle, 1756; a seat for a bowling-green for Lord Deskford, 1757; a paper dated Venice, 24th Aug. 1760; the original sketches of designs for Parliament Houses, 1760, and "this British capital,

invented by James Adam, at Rome, 1762." The last memoranda serve to correct the mistake which has occurred in attributing to his brother ROBERT the *Journal of a Tour in Italy*, published in the LIBRARY OF THE FINE ARTS, No. 9, vol. ii, for October: 8vo. Lond. 1831; wherein it appears that he left Venice for southern Italy 3rd Oct. 1760. It seems that he contemplated an excursion, to measure and excavate, in Sicily; and that his brother WILLIAM sent out a vessel to carry him to Greece, but there is nothing to show that he fulfilled these intentions. He was on the road to Pæstum, 17th Nov. 1761, at which date he records an interesting account of his arrangements with Clerisseau, who, as well as Antonio Zucchi, travelled with him. The latter artist is probably the author of the exquisite designs of figures which adorn vol. vii* of the Adam's collection at the Soane Museum. Mr. Adam arrived at Rome 13th Dec. 1761, and commenced his route homeward in May 1763, returning by Florence, Bologna, and Parma. The brothers appear to have worked so entirely together, that reference must be made to the memoir of ROBERT. The elliptical bridge in the garden at Inverary, given in *Vit. Scot.*, pl. 74, is probably a design of the year 1755. One of the few drawings to which JAMES attached his signature in later life, is a "design of a building proposed to be erected by his Majesty at Richmond for a register of the weather," in the British Museum, dated 1770 (*Bib. Reg.* xli, 16 s.). The Adelphi buildings and Portland-place are quoted in the obituary of the GENTLEMAN'S MAGAZINE, as monuments of his taste and abilities: the same authority also mentions that he held the office of architect to the King until the reform of the Board of Works by Mr. Burke's Bill; and that, besides *Practical Essays on Agriculture, etc., together with Observations on Inclosures, Fences, Farms, and Farm-houses, etc.*, 2 vols. 8vo. Lond. 1789, and another edition in 1794, he was preparing for the press a History of Architecture. It is remarkable that the works at Drury Lane theatre, 1775, are the only designs to which the names of the two brothers as joint architects are affixed in their book; the new assembly rooms at Glasgow are assigned to them in the *New Vit. Brit.*, vol. i, pl. 8 and 9. G. B.

ADAM (WILLIAM), another son of the same WILLIAM, died in January 1822, aged 84, GENT. MAG. vol. xcii, p. 190. He never appears prominently as an architect during the lifetime of his more famous brothers, but seems to have managed the winding-up of their various enterprises. The houses at the N.W. corner of Whitehall-place, in which the peculiar style of his brothers is recognizable, were his work. G. B.

ADAMINI, Brothers, illustrious architects of S. Petersburg, built the catholic church in Zarskojeselo, of which the first stone was laid in 1825. 68.

ADAMS (PIETER), born at Utrecht, 23rd July 1778, was professor of architecture in the military school at Delft, and afterward in the drawing academy at the Hague. Becoming, in 1825, the town-architect at Rotterdam, he there built a new pier, stone bridge, fishmarket, and Roman catholic church. He designed the new front, besides several restorations, to the town hall; resigned, returned to Delft, and afterward resided at the Hague until his death, 20 June 1846. 24.

ADAMS (ROBERT), was buried in the north aisle of the old church at Greenwich, with this inscription:—"Egregio viro Roberto Adams, operum regionum supervisor, architecturæ peritissimo. ob. 1595." WALFOLE, *Anec. of Painting, etc.*, 8vo. Lond. 1828.

ADANA, the ancient BATHNÆ, is a large and cheerless, but well built town in Asiatic Turkey. It contains some good bazaars, but is chiefly interesting for the castle, the remains of the old walls, a Roman archway, a bridge said to be built by Justinian, and an aqueduct in perfect repair. 50.

ADAPTATION (It. *adattamento*; Sp. *adaptacion*; Fr. *adaptation*; Ger. *anpassung*); is the act of fitting anything to its purpose, as a design to its object, or an ornament to a design. It signifies an operation which follows that of adoption,

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or choice of a particular site, or style, or part of a style, etc., and, with ADJUSTMENT, includes the whole Vitruvian system of architecture.

ADDICE, an old term for ADZE.

ADDITION (It. *aggiunto*; Sp. *addición*; Fr. *addition*; Ger. *zusatz*), is used to express not only the act of joining one thing to another, or of augmenting one thing by the accession of others, but also the supplementary object itself. ADJECTION. For example, the hall and chapel at Greenwich hospital are additions to the original building fronting the river, and not merely an enlargement of an existing edifice, as is the new front recently attached to the main portion of Buckingham palace, executed by Nash.

ADEL or ADDLE, a parish in the West Riding of Yorkshire, is celebrated for its remains of a Roman town and many antiquities, discovered in 1702 and subsequently; as well as for its fine Norman church. THORESBY, *Duc. Leod.* fol. 1816.

ADELAIDE. The capital of South Australia, founded in 1835, and planned in the most regular manner, all the streets being at right-angles to each other. They are broad enough for every purpose, being from one to two chains in width; twenty-two principal streets and six public squares have been laid out, providing room for increase, and making the present city healthy and pleasant. A large space has been reserved for a public promenade, and ground, laid out as parks, is retained in the environs. Hindley Street, the principal place of business, is lined on both sides with good stone, brick, and wooden houses, some few of which are of a superior character; many of the stores or merchants warehouses are also massive brick or stone buildings. The principal edifices are the Government House; the Legislative Council House; North Terrace, which contains the Australian Company's offices, the Bank of South Australia, and Trinity church; S. John's church; and two or three chapels.

ADEN, an ancient and famous seaport of Arabia, now under British rule, is situated in the crater of an extinct volcano. The chief buildings are mostly of undressed stone, confined by timber posts and bands. The houses, or rather huts, ranged in rows across the valley, are very slightly constructed, many of them being entirely of wicker-work, with waggon roofs, covered with interwoven leaves of the date palm. Some of the roofs are flat. The valley of Tanks consists of a succession of hanging cisterns, forming deep reservoirs of semi-elliptical shape, excavated in the limestone rock, which are lined with flights of steps, and supported by buttresses of masonry; these are probably the remains of an aqueduct of red brick and stone, about eight miles long, built by the Turks (1533-1708). The mosques and minarets are nearly in ruins. 50.

ADEODATO. A name found on the architrave of the principal portal of the church of S. Andrea, supposed to have been the original cathedral of Pistoia. "Pecit hoc opus Graumons magister bon(us) et Adod frater ejus." 28.

ADHAD EDDAULAP, born in 936, died in 983. He succeeded to the throne of Persia in 949, and became famous throughout Asia, for his patronage of learning, and for his hospitals, mosques, and other superb buildings.

ADHESION. (It. *appigliamento*; Sp. and Fr. *adhesion*; Ger. *anhangen*.) A term in physics, denoting the force with which different bodies, placed in contact with each other, resist separation. It must not be confounded with COHESION. The fact of particular woods holding nails, screws, and bolts much better than others, and of the peculiar fitness of round or square nails for soft or hard woods, is familiar to every workman; but the reason has never been investigated. The only experiments on the subject, at all of a practical nature, or adapted to common purposes, are those by Mr. Bevan, in GILL, *Technical Repository* for March 1824. They are extracted, s. v., in STUART'S *Dict.*, art. *Adhesion*. NAIL. SCREW. 14.

ADINJIK. A small town in Asiatic Turkey; is now a mean place, surrounded with numerous relics of antiquity. 50.

ADIT. (It. *Andito*. Fr. *Galerie d'écoulement*. Ger. *Zugang*.)

A horizontal driftway or sough, by which access is gained to the working parts of a tunnel or mine, or to the main shaft: an inclination of about $\frac{1}{100}$ is usually given to the floor of the adit. The term *aditus* (It. *ingresso*; Fr. *entrée*) of the Romans, was more generally applied to the doorway in theatres, through which the audience entered from the outer porticos or corridors, to descend to the seats.

O. R. B.

ADJECTION (It. *aggiunzione*; Fr. *remplage*) is a term of very different meaning to ADDITION, properly so called; it is originally rather the filling up of an object, as used by Vitruvius, i, 6, such as inlaid ornament, than Adjection (It. *aggiunta*; Fr. *renflement*), the enhancement of a body, such as the catasis of a column, as used by Vitruvius, iii, 3.

ADJUSTMENT. (It. *aggiustamento*; Sp. *ajustamiento*; Fr. *ajustement*; Ger. *anordnung*.) The act of regulating claims opposed to one another; the word is used to express the fitting of a plan to a site, of an elevation to a plan, of a section to the elevation, or of the details of ornaments or accounts. As above observed with respect to ADAPTATION, the whole architectural system of Vitruvius may be said to be an exposition of the varied application of these two terms. The adjustment of instruments implies the act of making them ready for use.

ADJUTAGE, usually written AJUTAGE.

ADLERKRANTZ (BARON VON), living at Stockholm in 1823, enjoyed a very considerable reputation in the north of Europe, as his works are counted amongst the most successful attempts of architecture in his native country.

68.

ADMEASUREMENT (It. *misuramento*; Sp. *mensura*; Fr. *mesurage*; Ger. *ausmessung*) is both the act of deriving, by the processes of the art of mensuration, a result from dimensions previously obtained; and the result itself as the representation of those processes.

ADMIRALTY (It. *ammiragliato*; Sp. *almirantazgo*; Fr. *amirauté*; Ger. *admiralität*), properly Admiralty (from the Greek *αμυρ*, the Arabic emir or ameer, applied to the officer of the fleet, who was the third great officer of the Eastern empire). The building forming the head quarters in which the business of the marine department of a government is conducted. Any complete edifice designed for such a purpose must contain, besides the entrance halls, servants' rooms, vestibules, and corridors; the private offices of the minister, his secretary and clerks, with waiting rooms to each; an audience chamber, and levee saloons; the private, clerk's, and waiting rooms, devoted to the business of every branch, such as general superintendence, general finance, naval architecture, commissions, marines, naval pay, victualling, stores, hydrography and compasses, astronomy, telegraphic communication, a library, archive offices and museum; besides these features, the peculiarities of the department in each country must be remembered; thus, in England, the privileges of the Lord High Admiral or his representatives include at least two courts of law. The Admiralties of Paris and St. Petersburg are the only executed monuments of this species which deserve the study of the architect. The latter is described and illustrated by GRANVILLE, *Guide to St. Petersburg*, 8vo. Lond. 1835, vol. ii, p. 55.

ADMIRATION (It. *ammirazione*; Sp. *admiracion*; Fr. *admiration*; Ger. *verwunderung*). A word very well reserved by a French critic for the sentiment which ought to be excited by a work assembling together all the different species of perfection in the art. BLONDEL (*Cours d'Architecture*, 8vo., Paris, 1783) observes, that the decoration of a room, or the workmanship of a building, cause an admiration, not worthy of the name, if it be not solely applied to the feeling produced on studying an edifice, which combines exquisite decoration, judicious distribution, and perfect construction, with that ORIGINALITY which marks the intellect of the designer.

ADOBE, ADOBES. (Arabicè, *at-tob, tobi*.) The Spanish term for the unbaked bricks of which the cottages in the kingdoms of the Castiles and Leon, and in many parts of the old Spanish dominions in South America, are built.

28.

ADONHIRAM, see HIRAM.

68.

ADOPTION. (It. *elezione*; Sp. *escogimiento*; Fr. *election*; Ger. *zueignung*) see ADAPTATION.

ADOS. A term used for water in which red hot iron has been extinguished.

13.

ADRANOS is said to be the modern name of HADRIANA.

50.

ADRIA, ATRIA or HADRIA, a bishop's see, situated between the mouths of the Po and Adige, stands a little north of the old town whose massive walls and the ruins of an amphitheatre, of baths, aqueducts, and mosaic pavements, with Etruscan and Roman antiquities, are found many feet below the surface of the ground.

28.

ADRIAN, more properly HADRIAN, when applied to the Roman emperor of that name, and to cities called after him.

ADRIAN I. A noble Roman, raised to the papal chair in 772, and always mentioned as a patron of art, died in 795. He evinced his passion for building, in the embellishment of the cathedral of St. Peter; the destruction of the temple of Ceres and Proserpine to build Sta. Maria in Cosmedin; and the expenditure of vast sums in rebuilding the walls, and restoring the aqueducts of Rome.

ADRIANOPLE, properly HADRIANOPLE, in Roumelia, had its name changed from Antinoa, when Hadrian restored the city. It is the see of a Greek bishop, and was once the capital of European Turkey. The city, about five miles in circumference, contains a citadel, in which are an arsenal and cannon foundry; has eleven gates; two scalls; four mosques; ten churches; eighteen khans; twenty-eight caravanserais; twenty-two public baths; five stone, and eight wooden, bridges; fifty-two fountains; and some superb houses; the streets are remarkably narrow. The chief bazaar, that of Ali Pacha, is a brick building, about eighteen feet broad and nine hundred feet long, walled on each side, and vaulted to resist fire, with arches composed of alternate red and white bricks: there is an entrance gate at each end, besides four lateral ones. The mosque of Sultan Selim II, consisting of one great apartment, a fine cupola, and 999 windows, according to report, considered the finest temple in the Ottoman empire, was chiefly built with materials brought from the ruins of Famagosta, in Cyprus. Three spiral staircases, winding round each other, separately conduct to the different galleries of four elegant, lofty, and fluted minarets, to the highest of which the ascent consists of 377 steps. The antique columns of the cloisters, of various orders and sizes, are of the most costly materials, either verd antico, Egyptian granite, or Cipollino marble. The palace of Sultan Selim, and the aqueduct, a noble structure, ascribed to Suleiman, are also interesting.

ADUANA, a Spanish word derived from the Arabic language, seems to be the origin of the French term *douane*, a custom-house, or place where merchandise is registered and payment made of the duty claimed by the state. The office for collection was used by the Arabs, as it is in England at the present time, for the receipt of taxes as well as a place in which many affairs of administration were discussed; and this last employment is still indicated in the modern use among the Turks of the word *dixan*, spelt by LANE, *deewan*.

66.

ADUAR. A kind of ambulatory village used by the Arabs, consisting of a sort of tents; thirty thousand were reckoned to exist in the territory of Algiers, in the last century. The word is sometimes written *adouar* and *adouard*. It is the plural of the Arab word *dar*, signifying a house, and indicating that its external and internal shape is round.

13, 66.

ADVENTITIOUS (It. *avventiccio*; Sp. *adventicio*; Fr. *adrentice*; Ger. *zufällig*). An epithet appropriate to an effect or shadow, not properly belonging to any object, but casually joined to it, as the shadow of a passing cloud upon a building, occasionally introduced in drawings.

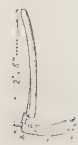
ACCIDENTAL.

ADVOWSON. The right of presenting a fit person to the bishop, to be by him instituted to a certain benefice which has become vacant. This patronage may be the property of a lay-

man, and is subject to alienation, transmission, &c. The person enjoying the right is called the patron of the church, who alone was formerly permitted to occupy a seat within the chancel or choir, at a time when that part of the building was partitioned off from the nave, and reserved for the otherwise exclusive use of the clergy. KENNETT, *Paroch. Antiq. Glossary*, s. v. Patronus. The right is termed an advowson, (*advocatio*), which may be either "appended" or "in gross"; and in estimating the value of advowsons, which is frequently the duty of an architect, it is necessary not only to distinguish between these, as the right of presentation for ever, and the next presentation, but to consider the many drawbacks upon the apparent value of the living, which may be considered as an annuity. There are many modes of valuing that annuity, and those which give the very highest results, are to be found s. v. in the PENNY CYCLOPÆDIA. Besides the exact probability of the life of the incumbent, (for simony is to be avoided), the valuer has to ascertain whether the next presentation be already alienated; whether there be a necessity for one or more curates; the size of the parsonage house in relation to the wants of the next occupier; the extent of the parish and facility of communication: the probable amount of dilapidations, &c. But far beyond these drawbacks are the facts that the purchased presentation, (if *pro hac vice* only), may be given to a person as young as the law permits, viz., twenty-four years of age, which renders the probability of another presentation worth about 17.8 years less in purchase; that the property may possibly be affected by legislative enactments; and that when the incumbent of a living is promoted to a bishopric, the crown has a right to present to the living, in lieu of the proprietor of the advowson, and may thus, by successive promotions, deprive the patron of his right for an indefinite time: for example, it was mentioned, by the Judges, that by several exertions of the Royal prerogative, the patron of the metropolitan parish of St. Andrew's, Holborn, was prevented from presenting more than once in a hundred years. SIR B. SHOWER, *Reports*, (King's Bench), vol. i, p. 468.

ADYTUM. (Gr. *ἀδυτον*, also called by LUCAN, ANTRUM.) That sacred place in temples into which only the priests were allowed to enter, and where the oracles were delivered. It was the Sanctum Sanctorum of the Jews. The secos of the Egyptians, as described by STRABO, was surrounded by facilities for imposition; but in the Greek temples there was little apparently corresponding to the secos, unless the chamber, commonly called the Treasury, in the Parthenon, was the same thing; the darkened portion of the cella however was called adytum. It was sometimes furnished with a subterranean passage like that of Neptune in the Isthmus of Corinth mentioned by PAUSANIAS, and this was especially the case where oracles were given. One mentioned by the same author was discovered at the foot of the Acropolis of Argos. There were twenty-five such impostures in the Peloponnesus, and as many in Bœotia; the Hieron of Trophonius, also mentioned by him, still exists, but perhaps the adyta best preserved are those of a temple at Alba Fucensis, and of the temple of Isis at Pompeii. The ceilings of both are raised some steps above the floor of the temples. In later times the term was applied to the BEMA. It clearly appears behind the semicircular apse of a small Doric temple given in *Libro d'Antonio Labacco appartenente*, etc., Roma, fol., 1557. 79.

ADZE, formerly called ADDICE. (Lat. *ascia*; It. *ascia*, *accetta*; Sp. *azuela*; *azuelilla*; Fr. *herminette*; *aissotte*, *essette*; Ger. *hohbeil*; *kleine botticher*.) A carpenter's instrument used as an axe, but of which the blade is made curved, and with its edge not like the axe and hatchet, but placed at right angles to the handle. It is ground on a base or to a BASIL, from the inside to its outer face; and on this account the HELVE must be detached from the eye, whenever the edge requires repair. It is used where a plane, though rank set, will not make riddance enough, in taking off in thin chips the irregularities of the boards and timbers of floors, and of posts ranging



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with other work framed to them, where the edge of the axe cannot go. The foreign diminutives imply an adze of small size, used with only one hand by coopers.

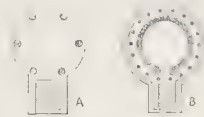
ÆBURA, in Spain, the ancient name for TALAVERA.

ÆCCLESIOLOA, properly ECCELSIOLOA.

ÆCULANUM or ÆCLANUM, now LE GROTTÉ. An ancient city, nearly a mile from the modern Mirabella, on the high road from Naples to Puglia, which was destroyed about the year 662. The ruins and foundations of baths, aqueducts, and temples, of an amphitheatre, and other buildings, have been discovered. GUARINI, *Recherche sull' antica Città di Eclano*, 4to, Naples, 1814.

ÆCUS, properly ECUS.

ÆDES, or ÆDIS. The Latin term for a house, dwelling, or edifice of any sort, (CÆVEDIUM); but besides therefore representing the presumed habitation of a deity, it sometimes signified a part of a house, a room, or chamber: its proper application, however, was to a town house of a large size, as a palace, (DOMUS being used for a private dwelling,) and VILLA to one in the country. The religious ædes was not properly a TEMPLUM, FANUM, DELUBRUM, or SACELLUM, inasmuch as it was not consecrated by the augur, (POMERIUM); but merely dedicated by the piety of man, through the priest. Thus the sanctuary of Vesta was only *ædes sacra*. In consequence, this sort of edifice served for profane purposes; at Rome, the Ædes Saturni was also the ÆRARIUM. An ædes might be circular in its plan, and then it was called *rotunda*: of this sort BATISSIER makes only two classes, *monopterul*, as fig. A, and *peripteral*, as fig. B. Those of the first kind have been destroyed; the instance at Puteoli which he gives as having three out of sixteen columns remaining, is considered to have been a part of the *therma*, or of the temple of Jupiter Serapis; but perhaps the building in the court of the Pantheon, near the Forum at Pompeii, may be quoted as an example. Two buildings of the second species still remain, one at Rome, the other at Tivoli; both of them originally had twenty columns. BATISSIER suggests that all *ædes rotundæ* which had more than eight columns, were not vaulted, but had simply roofs. VITRUVIUS, iv, 7, gives detailed instructions for these two species of ædes, to which may be added another class, consisting, like the Pantheon at Rome, of a circular wall without columns, except perhaps those forming an entrance portico.



ÆDESIOLA seems to correspond to SACELLUM. 80.

ÆDICULA. This term, in the singular, signifies a room, but in the plural, a small house. At other times it expresses a small temple, considered as a diminutive of the building called ÆDES. It is the Latin term for a shrine, placed by the Romans at the end furthest from the entrance of the cella, to receive the statue of a deity, and was either simply a pedestal, or a pedestal accompanied by two or more columns with their entablature forming a canopy, or it might be a large niche; a pediment was almost, if not quite, an essential feature; thus it appears on various coins of the Roman period. In the pedestal of the statue, the ancients sometimes contrived a passage to the penetralia, to which the priests alone had access. ACROPODIUM. ADYTUM. The word also means a small cabinet made of wood, after the model of a temple (and therefore equally a "shrine", in which the family busts, images, the Larcs and titular deities of a house, but oftener the guardian deities of the street, were preserved, and placed in cases round the atrium; or otherwise attached to the house. BALDACCINO. TABERNACLE. 25, 79.

ÆDICULUS, the deity supposed by the ancients to preside over the erection of buildings. 2.

ÆDIFEX is used in the sense of a builder by TERTULLIAN, *De Idol.* 12.

ÆDILES. The Roman functionaries thus called, corresponding to the Greek *astunomi* and *agoranomi*, had the super-

vision of public and private structures, and consequently maintained, supported, and upheld the public edifices, as temples, baths, aqueducts, etc.; and took care that private buildings in a ruinous condition were repaired by the owner, or pulled down. They also undertook the general superintendence of the water-supply, paving, cleansing, draining, sewerage, and police, the preservation of public order and decency, the inspection of baths, taverns, and brothels, the regulation of prostitutes, and the extinction of fires. **CURATORES.** 78.

ÆETIAIOI. (Gr. *αιτιαῖοι*, Ionic; *αιτιαῖοι*, Doric.) A term used in the celebrated inscription, now in the British Museum, relative to the construction of the temple called the Erechtheum at Athens; according to WILKINS, *Prousiones Architectonicae*, 4to, Lond. 1837, it appears to have been applied by the Greek architects to the stones or slabs executed with vertical joints, one course of stone in height, which form the face of the ÆTOS, or tympanum.

ÆGESTA, properly **EGESTA**, the ancient name of SEGESTE.

ÆGICRANES. Sculptured representations of the heads and skulls of goats, which are used as a decoration on altars, friezes, etc. 2.

ÆGINA. (Gr. *Αἴγινα*). An island in the Gulph of Athens, famous throughout ancient history, for its political, commercial, manufacturing, and artistic pre-eminence. Æa, in the centre of the island, was the aboriginal capital, as also that of the middle ages to recent times. The port, situated to the north-west, became the capital in the most flourishing period, a fact attested by the remains of two artificial harbours, of walls of great extent and solidity, of a stadium on the land side, and of a large temple within the walls of the city, which was Doric, hexastyle, 65 feet wide on the top step of the stylobate, with columns of very fine proportion, 4 ft. 3.58 in. diameter, 25 ft. 3.25 in. high. The temple of Jupiter Panhellenius, on the Panhellenian Mount, was situate to the east of Æa, and is still conspicuous from Athens, and the entrance of the Saronic gulph. It was explored, and the ruins excavated in 1811, by Messrs. Cockerell, Foster, Haller, and Lynckh, with very remarkable success, in elucidation of every desired architectural detail, and of the then unascertained style of the Æginetan school of sculpture, constantly mentioned by ancient writers as of the first merit and of universal estimation. The order is after the archaic Doric type, of which few specimens exist in Greece Proper; it is especially illustrated in the well known existing temple of Neptune, at Paestum: the temple is hexastyle, peripteral, but has twelve columns only in the flanks; the axes of the columns incline towards the cella, as enjoined by VIRUVIUS, and a slight entasis is observed in their contour: the cella is divided longitudinally, as at Paestum, by two rows of five columns on either side, over which are placed as many more of smaller dimensions, carrying the hypæthral roof. The top step of the stylobate measures 93 ft. 1 in. by 44 ft. 10 in., the height to the point of the pediment is 35 feet; the external columns are 3 ft. 3 in. diameter, and 17 ft. 2.8 in. high. The pediments and acroteria were adorned with not less than thirty-four Parian statues, representing the two Trojan wars, in which the Æacidae were engaged more especially; the caves-tots were also of Parian marble, while the others were of terra-cotta painted: the polychromy of the members of the architecture throughout was distinctly ascertained: the pavements of the pronaos and cella were covered with a fine stucco of deep crimson colour. An inclined pavement at the east end surmounted the third step of the stylobate, and conducted to the centre intercolumniation: to the right an altar for libations was attached to the stylobate: channels for the discharge of the caves water, and the paving of the platform were also discovered in their original situations. A great variety of interesting details must be passed in silence. The temple, built of fine grey limestone from a quarry at no great distance, stood upon a platform, 240 ft. by 125 ft., raised on the Panhellenian Mount, about twelve feet high to the east, north, and west, and to the south by successive terraces; the approach by a propylon through the

wall of the peribolus is still traceable on the south-east angle: on the north side is a cave which appears to have communicated with the floor of the temple. The date of this fine edifice must be a matter of conjecture; the Æginetans were building a temple to Panhellenian Jupiter, in Egypt, about 563 B.C.; this work was doubtless a restoration of an anterior temple, and perhaps not long antecedent to that of Theseus at Athens; a comparison of which will show an improved disposition of the plan, and somewhat larger dimensions, (104 ft. 2 in. by 43 ft. 2 in. on the stylobate, the columns being 3 ft. 3 in. diameter, and 18 ft. 7 in. high); but this work can hardly be deemed of a more recent date than the sixth century, B.C. **SOCIETY OF DILETTANTE, *Inedited Antiquities of Attica*, 2nd edit. C. B. C.**

ÆGIS. A goat-skin belt, with the head of the Gorgon. Although strictly part of the armour of Jove, it was bestowed on Apollo and Minerva (Athena). According to early statues, the skin had two of its legs tied over the right shoulder of the wearer, the other extremity being fastened to the inside of the shield. In the middle of it was fixed the Gorgon's head, and its border was surrounded with golden tassels. The serpents of the Gorgon's head were sometimes transferred to the border of the ægis. The later poets and artists represent it as a breast-plate covered with scales; and when worn by the emperors, it was called **LORECA**, until the time of Martial, who then calls it the ægis; SMITH, *Dict. of Antiq.* gives well-selected details and illustrations of the use of the ægis, particularly of its being wrapt round the arm of Zeus as a shield, an idea adopted metaphorically in modern times.

ÆGRICANES, properly **ÆGICRANES**.

ÆGYCI is a mistake in STUART, *Dict. for AGYIEUS*.

ÆGYPTILLA is given by STUART, *Dict. s. v. AS ÆGYPTILLA*, and applied to a species of Egyptian ornaments, having a light blue figure or device on a dark blue ground, whereas, by PLINY and others, it is the name applied to a gem, with a similar description.

ÆLBRECHTS (HENDRIK), was appointed with Louis Gerbrandt and Klaas Huygens, in 1449, to build the town hall at Gouda. 24.

ÆLFRIC (ABBOT), see MALMESBURY.

ÆLIA CAPITOLINA. The name given by Hadrian to JERUSALEM.

EMASIA (Gr. *αιμασιὰ*). A fence or fence-wall.

ÆOLIPYLA. A hydraulic instrument, mentioned by VIRUVIUS, i, 6, consisting of a hollow vessel, with only a very small opening or else with a slender tube inserted in that orifice, into which water was poured before it was placed upon a fire. Among other uses, this ancient attempt at the subjugation of steam has been applied, especially in Italy, to cure smoky chimneys; for if it be placed where the ball can be heated, and the jet directed up a flue, the blast arising from it produces a current, and carries the loitering smoke along with it. It is illustrated and recommended by PHILIBERT DE L'ORME, and the principle has been applied, by FARADAY, to ventilation by the steam jet.

ÆOLUS. A machine invented about the year 1780, by a person named Tidd, for refreshing and changing the air in rooms; it was probably what is now called a fly ventilator. 13.

ÆQUAM, now SEIGN or SIGNO, a town not far from Spalatro in Dalmatia, is a site upon which fragments of architecture are occasionally discovered, and has not yet been explored. 2.

ÆQUIMELIUM. A part of Rome, so called because there the house of the conspirator Melius had been levelled with the ground. VARRO, *De Leg.* iv, 32.

ÆRA. The point of time from which to count years, whether precedent or subsequent. This has been variously chosen by different nations; for those with which the dates of buildings are most frequently given see PENNY CYCL. s. v., and HARRIS NICOLAS, *Chronology of History*, 8vo, Lond. 1838.

ÆRA (*αἶψα*) the Greek term for a hammer, mallet, or cleaver.

ÆRARIUM. The name for the public treasury of the Romans, which was placed in three small vaulted chambers, ranged side by side, at the back or further end of the *Ædes Saturni*; together with the money, it held the accounts, legionary standards, laws on the brazen tables, despatches of generals and governors, and copies of decrees of the senate, the originals of which were kept in the temple of Ceres. 78.

AERIAL PERSPECTIVE. The recession of colour into distance, accompanying **LINEAR PERSPECTIVE**, which gives the recession of form. Although the principle is well known that the longer the column of air through which an object is seen, the weaker is the effect of that object on the retina of the eye, no laws have yet been prescribed by painters for the graduation of the loss of force and lustre, according to the distance, of colour; and this branch of colouring remains one in which the student has to instruct himself, by observing the truth as it is in nature, and studying the mode of representing the desired effect, used by Turner and other painters who have excelled in this most important department of pictorial art.

ÆRO. The word employed by **VITRUVIUS**, v. 12, for the basket for carrying earth, etc., used by the Romans in their excavations, etc.

AERO-DYNAMICS. (Gr. *ἄηρ δύναμις*.) The science relating to the active powers or forces of gaseous fluids. These may either be produced by an expansion of volume in the gases, or by an initial velocity impressed upon them by the wind or any other external agent. In either case a force must be exerted, because the pressure of the air (estimated at fourteen to fifteen pounds on every square inch) is to be overcome before any expansion can take place. The condensation of air before a moving body is propagated onwards at the rate of about 1125 feet per second; and as the air, though forced with great rapidity into the space behind the body, does not occupy the vacancy instantaneously, there is a diminution of the pressure behind, which increases the effect of the resistance in front. (**ANEMOMETER**.)

The expansion of gaseous fluids, of whatsoever description, is characterised by a law of remarkable simplicity, viz., that all pure *aëriiform bodies contract and expand alike, under the same conditions of temperature and pressure*. If one hundred measures in volume of atmospheric air have their temperature raised from 32° Far. to 212°, they will be found to have increased in volume to 137.5 measures; and steam and all other vapours, if heated out of contact with their respective fluids, are subject to precisely the same law of expansion. The specific gravity of the gaseous fluid naturally diminishes in the proportion of its increase in volume; and inasmuch as the repulsion between the ultimate molecules becomes augmented by the accession of heat, if the fluid be not allowed to expand, its elastic force will be increased to an extent depending upon the nature of the fluid and the amount of heat absorbed.

The expansion of *aëriiform fluids*, or those gases which form the atmosphere in which we exist, is one of the most powerful agents employed in securing a good system of **VENTILATION**. The elastic force of *aëriiform fluids* at high temperatures is the property which is employed in steam and caloric engines. **STEAM.**—*Encyc. Metrop.* s. v. **PNEUMATICS.** G. R. B.

The following well-known table, first given by **SMEATON**, in the **PHILOSOPHICAL TRANSACTIONS** for 1759, and confirmed by the experiments of Dr. Hutton, shows, in pounds avoirdupois, the force or pressure which different winds will exert upon a square foot of surface exposed directly against them. The first column is a rough representation of the second.

The impulse of wind increases as the square of its velocity; and the force or pressure per square foot, in lbs., as the square of the velocity multiplied by .002288. **TREDGOLD**, *Elementary Principles of Carpentry*, and *Essay on the Strength of Iron*, has minutely examined the effect of the above forces, and the principle of forming the necessary resistance to them in the construction of walls and roofs.

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Miles per hour.	Force in lbs. per sq. ft.	Force in lbs. per sq. ft.	Force in lbs. per sq. ft.
1	1.47	.005	Hardly perceptible.
2	2.03	.020	Just perceptible.
3	4.40	.044	
4	5.87	.079	Gentle, pleasant wind.
5	7.33	.123	
10	14.67	.492	Pleasant, brisk gale
15	22.00	1.107	
20	29.34	1.978	Very brisk.
25	36.67	3.075	
30	44.01	4.429	High winds.
35	51.34	6.027	
40	58.68	7.573	Very high.
45	66.01	9.963	
50	73.35	12.300	Storm or tempest.
60	88.02	17.715	Great storm.
80	117.36	31.490	Hurricane.
100	146.70	49.200	Destructive hurricane.

ÆRUCA. A bright green colour, artificially made to imitate the natural **ÆRUGO**, or verdigris, which bronze acquires under some circumstances from age. **PLINY**, *H. N.* xxxiv, 26; **VITR.** vii, 12.

ÆRUGO (Gr. *ἰὸς χαλκοῦ*). The bright green verdigris which bronze acquires from age, as distinguished from **FERRUGO** or **RUBIGO**. **WINKELMANN** (*Storia delle Arti*, vii, 2, 10) says that the older the bronze, the brighter the colour; but experience leads to the disbelief of this opinion.

ÆS (Gr. *χαλκός*). These words mean only copper, which was used by the ancients, until the discovery of iron, for every possible purpose, including columns, with their capitals, bases, and even complete porticoes; **LIVY** xxxv, 36, mentions a whole edifice, the temple of Minerva at Sparta, of this material. The whole face inside of the subterranean chamber at Mycenæ, is described by **DONALDSON**, 4th or suppl. vol. *Antiq. of Athens*, fol. Lond. 1830, to have been covered with thin plates of brass or bronze, fixed to the stone construction by metal nails, the holes of which were very evident. The words may either be taken for pure copper, or for a mixture of metals in which it is predominant; in the latter case they mean **BRONZE**, not **BRASS**; for zinc has rarely, if ever, been found in the analyses, which give 87.43 copper, and 12.53 tin. **CHALCE**. **CHALCIGECON**. *Æs*, as modified by various adjectives, as *Corinthiacum*, etc., will be found fully treated in **SMITH**, *Diet.* s. v. 14.

ÆSCULAPIUS. The god of the medical art, whose temples were usually built on hills outside cities, and often near healing wells. The principal seat of his worship in Greece was *Epidauros*, where there was a magnificent temple, a large theatre, a sanitarium, and extensive buildings for the crowds who resorted thither for the recovery of their healths. His worship prevailed also at *Tricca*; *Celene*; *Tithorea*; *Megalopolis*; near *Cyllene*; in the island of *Cos*; at *Gerenia*; near *Caus*, in *Arcadia*; *Sicyon*; *Athens*; near *Patra*; at *Titane*, in the territory of *Sicyon*; *Thelpusa*; *Messene*; *Phlius*; *Argos*; *Ægium*; *Pellene*; *Asopus*; *Pergamum*; *Lebene* in *Crete*; *Smyrna*; *Tralles*; *Ambracia*; and other places. The temples of *Epidauros*, *Tricca*, and *Cos*, were full of votive tablets, several of which are extant, offered by those who had recovered. **VITRUVIUS**, in the preface to book vii, calls a temple to this deity *Æsculapium*. Of such establishments the most remarkable was perhaps that built B.C. 293, on the island in the Tiber at Rome, which was shaped and faced with travertine stone, to present the outline of a ship, an obelisk being placed so as to resemble a mast. The staff and serpent of *Æsculapius* may still be seen sculptured on the stones meant to imitate the ship's prow. The church and convent of *S. Bartolommeo* are supposed to stand on the ruins of the temple, and of the famous hospital attached to it. 28, 59.

ÆSCULUS. A genus of plants belonging to the natural order of *Hippocastaneæ*. It must not be confounded with the *æsculus* of the Romans, which was a kind of oak. **QUEBET.**

The chesnut forms a magnificent tree, grand from its magnitude, massy form, and beautiful blossoms. It was much used when the geometrical style of gardening was in vogue, and, being of quick growth, it is still extensively planted wherever round masses of wood, or gay flowering trees are required, being adopted for the outskirts of plantations, for avenues, or singly on lawns. It is well suited for light lands; but is stunted and unhealthy when planted on a tenacious clay, such as that in the Regent's Park, London. CASTANEA. FAGUS. PAVIA.

1. Æ. Hippocastanum, the common horse-chesnut, Northern Asia (!) The wood is soft, and not applicable to any purpose where strength is required; in the open air, it has little durability: where it can be constantly covered with earth, it has been employed for water-pipes. (CRESSY, *Dict.*) Useful for inlaying cabinet work, Ton-bridge ware, stained ornamental work, and dry carpentry. 71.
2. Æ. Ohiotensis, N. America, 10 to 35 feet, flowers early in the spring, large white blossoms; but has never flowered in this country.
3. Æ. Carnea, or rubicunda or rosea, is distinguished from 1. by its lesser size, and in having deep rose-coloured blossoms of striking beauty, rendering it, for the purposes of ornament, much superior. 14.

ÆSTHETICS (from the Greek αἰσθῆσις, I perceive). This term has been defined by W. R. HAMILTON, *Transactions of the Institute of British Architects*, 4to., Lond., 1836, as "the science of investigation and judgment in works of the imagination, whether in literature or the fine arts, according to the principles of sound philosophy, and the rules of logical deduction." C. DE VIENNE, translating SCHLEGEL's *Lectures on the History and Theory of the Fine Arts*, 8vo. Paris 1830, gives this definition, "the theory of sensations and sentiments"; and states, that æsthetical ideas are those, which are the result of the imagination and of the senses, in opposition to those which arise from reasoning only. The term was probably first used as the denomination of the science of taste, i.e., of the principles of beauty, by a German professor of philosophy, and pupil of Christian Wolf, named ALEXANDER BAUMGARTEN, in his work entitled *Æsthetica*, 8vo., Frankfort-on-the-Oder, 1750-58: and it was introduced into the English language in the year 1804, by Prince Hoare, secretary to the Royal Academy of Arts, in London, in his translation of a work by J. R. FUSCII, a brother of the celebrated member of that Academy. The science, like most others, consists of synthesis and analysis, or design and criticism, or fancy and judgment; but most writers have divided their works upon the science into two parts, viz., one, the philosophy of the nature of beauty, and the other, the principles to be derived from the theory formed by that philosophy, and their application to the various branches of the arts. It is to be noticed that FERGISSON (*Historical Enquiry into the True Principles of Beauty in Art*, 8vo., Lond. 1849) has used the word æsthetic in a different sense from that commonly received, by considering it as only relating to the power of pleasing, including the whole province of beauty in its ordinary sense; i.e., as beautiful without expression; in which use of the word he is followed by GARBETT: whereas the common meaning of the word "Æsthetic" is that which is contained in the term philosophical-artistic.

Besides the works mentioned under this head in ELMES, *Dict.*, in THE PENNY CYCLOPEDIA, and in PEIRIER, *Unic. Lexikon*, 34 vols., 8vo. Altenburg, 1845, the following authors may be consulted.

P. GAUDENTZ, *Saggio sul buono gusto, gli Elementi dell' Estetica*, 12mo., Firenze, 1771; G. B. TALLIA, *Saggio di Estetica*, 8vo., Venezia, 1822; and *Principi di Estetica*, 2 vols., 8vo., Venezia, 1827; W. E. WEBER, *Die Æsthetik*, 8vo., Darmstadt, 1834; J. H. WOLFF, *Beitrage zu Æsthetik der Baukunst*, 8vo., Darmstadt, 1834; DR. B. H. C. LOMMATZCH, *Die Wissenschaft des Ideals*, 8vo., Berlin, 1835; IGNAZ JEITTELES, *Æsthetisches Lexikon*, 2 vols. 8vo., Wien, 1835-7; F. A. NÜSSLEIN, *Lehrbuch der Æsthetik*, 8vo., Regensburg, 1837; H. JOUFFROY, *Cours d'Esthétique, analysé et traduit en partie par C. Bénard*, 2 vols., 8vo., Paris, 1840-3; J. RUSKIN, *The Seven Lamps of Architecture*,

8vo., Lond., 1849; and *The Stones of Venice*, 8vo., Lond., 1851. E. L. GARBETT, *Rudimentary Treatise on the Principles of Design in Architecture*, 8vo., Lond., 1850.

ESTUARIUM. A term applied, in the description of the ancient baths, to the flue from the hypocaustum or stove, to the chambers; PRISCUS, *Lex. Antiq. Rom.* and for a tunnel or vent for drawing off bad air, VITRUVIUS, viii, 7.

ESYMNIIUM (Gr. αἰσμηνιον). A building in Megara, so called after Æsymnius, its founder, who erected that edifice, which consisted of a council hall round the tomb of his countrymen who died in battle against the Persians. PAUSANIAS, *Descr. Gr.* i, 43.

ETHERIUS is mentioned as having filled one of the first posts in the service of the Emperor Anastasius I, 491-518, and as having erected the splendid vestibule, called χαλκή (CHALKE), in the palace at Constantinople. He is also supposed to have built the wall, 54 miles long and 20 feet broad, which extended from the sea to Selymbria, in Thrace, to defend Byzantium from the incursions of the Bulgarians and Scythians. ZEDLER, *Lex.* 56.

ÆTHOUSA (Gr. αἰθουσα). The portico on the sunny side of the court of a Greek dwelling, properly the porch or portico in which persons could sit and enjoy the warmth of the sun. It was also the place where strangers slept, and which received the crowd upon public occasions. *Iliad* and *Odyssey*, *passim*. The visitors entered it from the πρόθυρον, or αἶθλη, and passed into the πρόθυρος, (an innermost room being θάλαμος); but in *Odys.* iv, that which was αἰθουσα in verse 297, seems to be the πρόθυρος in verse 302. In the Rhodian fashion of peristyle this side had loftier columns than those of the other porticos around the αἶθλη. VITRUVIUS, vi, 10.

ÆTIAIOI, wrongly written ÆTIAIOI; see ÆETIAIOI.

ÆTOS and ÆTOMA have usually been incorrectly written Ætos and Ætoma (Gr. αἶτος, αἶτωμα), literally "the eagle", or "the place of the eagle"; which is generally considered to imply the tympanum of the pediment, because, as observed in SMITH, *s. v. Fastigium*, that portion, when it began to be ornamented with sculpture, was decorated with an eagle in the early temples of Zeus, as the symbol of that deity; and authorities are cited, and a coin used in illustration, to support the assertion that the word ætos was at first applied to the tympanum, and afterwards to the whole pediment: this seems a position very difficult to support, in opposition to the numerous coins which exhibit the eagle as the acroterium, or rather on the acroterium, of the apex of the pediment. It appears that the custom of ornamenting the apex of the roof, or ridge, with figures of eagles, was taken from the Corinthians, and that the name was given at first to the ridge, afterwards to the pediment, and then to the tympanum: on the principle of a part for the whole, however, the word might have been used for a gable-end, whether a pediment or otherwise; and where gables did not exist, for the point at which the inclined sides of a roof joined each other, or even for the ends of such a roof. STREPHENS, *Thesaurus*, *s. v.*, gives a list of the precise passages in which these words are used with reference to architectural details. ÆETIAIOI.

AFIOUM - KARA - HISSAR, AFIUM - KARA - HISSAR, or AFIVAN. A city in Anatolia, nearly three miles in circumference, in which most of the houses are of stone, and well built, but the streets are extremely narrow. Besides the Armenian bishop's chapels, there are ten mosques, one of which is a noble building, and several lofty minarets; numerous khans and public baths, a fine range of barracks, and remains of temples, palaces, etc., decorated with the peculiarly dark brown sort of granite, from which the town takes its name, Kara-hissar, or Black-castle. 50.

AGAMEDES is mentioned invariably with TROPHONIUS.

AGASIUS, or AGASTUS (S. P.); see POMPEIUS.

AGATA DEI GOTI (SANTA). The seat of an archbishopric in the kingdom of Naples; contains, besides a cathedral,

called "of the Assumption", seven parish churches, and an abbey.

AGATE (It. *agata*; Sp. *agata*; Fr. *agate*; Ger. *achat*). A species of flint, in which bands of various colours occur, in alternate and concentric layers. The basis of the composition of agate is silica, with variable proportions of alumina, iron, oxygen, and water. It occurs in nodules, in veins, or in stalactites, and is found in considerable abundance in India and Scotland; but the most beautiful agates are brought from Oberstein, in Saxony. Besides the German, there are three principal varieties, viz., the onyx, or oriental agate, the cornaline, and the black agate; more detailed information with respect to this mineral will be found in the *PENNY CYCLOPEDIA*, etc. Agate was employed by the ancients, among other materials, for mosaics; but probably the use of it alone for pieces of decoration, such as cabinets, shrines, tables, etc., as in the Florentine mosaic, which in England was formerly called agate-laid-work, is an application not older than the commencement of the sixteenth century.

G. R. B.

AGDE, in Roman times **AGATHA**, a city in the Dep. of Hérault, in France, is sometimes locally called the *Ville Noire*, from the black volcanic basalt with which the very ancient cathedral, dedicated to St. Etienne, its tribunal of commerce, exchange, and other edifices are built. The see was suppressed in 1801. 50.

AGEDINCUM, in France, the ancient name for SENS.

AGEN (Lat. *Agennum* or *Aginum*). A town in the Dep. of the Lot et Garonne, in France, is of little interest, except for the suspension bridge and a handsome bridge of eleven arches; S. Jacques hospital; the prefecture, originally the episcopal palace; and the church of S. Caprais, described by BOURASSÉ as the present cathedral, with its apsis, three chapels of the *chevet*, and three pillars at the transept, all of the third epoch of the style *Romano-byzantine*, and two bays of the nave, in the style *ogival tertiaire*. The old cathedral dedicated to St. Etienne, has been destroyed, and its site occupied by the cattle-market. It also possesses a college, public library, theatre, house of correction, and several literary and scholastic institutions. 50.

AGENT. An agent is a person authorised by another to do acts or make engagements in his name; and the person who so authorizes him is called the principal. The agent may be appointed in writing (in some few cases a deed is requisite), but a verbal appointment is quite sufficient. The *PENNY CYCLOPEDIA* contains a long article on this subject. PALEY, *Treatise on the Law of Principal and Agent*, with additions by Lloyd, 8vo. Lond. 1833.

T. T.

AGERHUS, in Denmark, usually known as **AARHUS**.

AGGER. The Roman term for a mound of stones, earth, or any other substance, which was applied to the earthen wall raised round a besieged town; as well as to that formed round an encampment, by the earth dug out of the fosse. This last was usually nine feet broad and seven feet deep; but if any attack were apprehended, it was made thirteen feet broad and twelve feet deep. The stakes or palisades on the top formed the *VALLUM*. The celebrated rampart of peperino stone, at Rome, was also called Agger. It is said to have been built by Servius Tullius, and to have been fifty feet broad and a mile in length, with a fosse thirty feet deep and a hundred feet broad. This description may easily be reconciled with a restoration of the agger, or broad terrace of earth, between battlemented walls still remaining at POMPEII. The *agger vice* was properly the roadway, i.e. the part of a street which was intended for the traffic of carriages or cattle, and was paved with stones laid in HOGGIN, so as to form a curved outline, in section, between the curb-stones. It also answered to the modern embankment for a roadway. The agger is very perceptible along the line of the Roman wall in Northumberland; it is described minutely by BRUCE, *The Roman Wall*, etc., 2nd ed. 8vo. 1852.

AGGER is also applied to the eight great piers which carry the domical coverings of Sta. Sophia, at Constantinople. BATISIER, *Histoire de l'Art Monumental*, 4to. Paris, 1845.

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AGGER. This word has been lately introduced into the terms used by civil engineers. It is a wall or mound of stones grouted together, and then covered over with earth to form a mound, as an outwork and declivity of the fosse or ditch. It differs from the sunk fence, which is excavated from the level surface, by having a perpendicular wall or bank at one side, and an inclined plane on the other, so as to leave the appearance of a level field from that side where the wall is built. Where the Agger is excavated out of the hill, the wall is not introduced, but the natural earth forms the tumulus.

W. H.

AGGLUTINATION. (It. *conglutinamento*, *conglutinazione*; Sp. *aglutinacion*; Fr. *agglutination*; Ger. *zusammenleimen*.) The causing bodies to adhere by the interposition of a viscous, gelatinous, substance between them. The most important application of agglutination in the building arts, is that by which wood-work is put together by the aid of GLUE. The surfaces to be made to adhere to one another by the interposition of glue, are respectively covered with it in a semifluid state, and should then be brought into so close contact as entirely to exclude the atmosphere. With small bodies, this exclusion of air will procure an effective adhesion between them, even before the glue solidifies; but with larger ones, the adhesion produced by it can hardly be appreciated until the glue has given off, by evaporation, the water which held it in a semifluid state. Size, isinglass, paste, dissolved caoutchouc, gutta percha, and many other gelatinous substances, are capable of being employed in a similar manner to glue; but their value as agglutinating materials depends upon, firstly, their power of penetrating the pores of bodies to be joined so as to exclude the air from them; and secondly, upon their tenacity when solidified. G. R. B.

AGHABOE. A parish of Queen's county in Ireland, was the seat of a bishopric, removed from Ossory about 1052, and transferred to Kilkenny in the twelfth century. No traces exist of the ancient cathedral, on the site of which the parish church has been erected. About fifty yards from this church are the ruins of a Dominican abbey, founded in 1382, which consist of the nave, chancel, and south transept of the church; the central tower, the north wall of the nave, the cloisters, and the domestic buildings, have long been destroyed. The nave and chancel measure 103 feet in length, by 24 feet 6 inches in width; the west doorway is walled up; the east window was divided into three lights, traceried without cusping; the mullions of all the other windows are destroyed. There are a piscina and ambrey in the south wall of the chancel, and two piscinas with shelves and grooved basins in the transept. The dressings and ornamental portions of the building are executed in the fine black limestone abounding in this neighbourhood. A short distance from the abbey church is a large and well-formed tumulus, supposed to be sepulchral. The other antiquities of this parish are, a stone oratory at Lismor, the "Moat of Monacoghlan", and the ruins of ancient fortresses at Gurtualeihie, and Ballygihin.

R. R. B.

AGHADOE. A parish of the county of Kerry in Ireland, was the seat of a bishopric, which, having been joined to that of Ardfort, has merged with it in the see of Limerick. The remains of the ancient cathedral stand on a lofty eminence, about two miles from the town of Killarney, and consist of a nave and chancel belonging to different periods. The entire length is 80 feet, and the width 20 feet within the walls; the nave appears to be a building of the tenth or eleventh century; the south wall is destroyed; and the principal feature is the western doorway, of Romanesque character, with an arch of four orders; the outer one, decorated with a chevron, rests on piers with plain square-and-chamfered caps; the next has the pellet ornament, and rests on circular shafts, with curious sculptured caps; the third has a rich chevron moulding, and rests upon square piers, of which the surfaces are carved in low relief; and the inmost order is plain. The chancel, which is of early English character, is altogether inferior in workmanship to the nave; the chancel-arch is walled up. About fifty feet north-

G

west of the church, are the ruins of the Turaghan or round tower; these consist of the base of only twelve feet in height; the external circumference is fifty-two feet, and the walls are four feet in thickness. About two hundred feet from the church, are also the remains of a round castle, of considerable antiquity, called the Bishop's-chair; it has one round-headed window.

R. R. B.

AGIASTERIUM. (Gr. *αγιαστήριον*). The sanctuary which, in the basilicas of the Latin church, was separated from the choir of chanters by three steps and the *καγκελλοι* or *CANCELLI*, that extended right and left before the *MATRONEUM* and *SENATORIUM* on either side of the sanctuary.

51.

AGINIS, now **AHWAZ** or **AHWUZ**. A once flourishing place in Khusistan, a province of Persia, as is evinced by the numerous ruins, covering an extent of ground nearly eleven miles long, and about half that distance in width, and appearing to belong to nearly all periods.

14.

AGISTMENT LINE. A term derived from the practice of agistment, which expresses that a man takes another's cattle to feed upon his own ground, at a certain rate per week; the line of average height from the ground up to which the boughs are destroyed by cattle browsing, is called the agistment line.

AGLIANDIUS or **AGLIANDUS**, (IGNATIUS), was living at Turin about the year 1737; he published *La Vue de la Vigne de S. M. la Reine près de Turin, avec l'Illumination faite en 1737*.

60.

AGLIA or **AGLIO**. A town in Piedmont, containing a collegiate church, and a superb royal residence, with its library, and a choice collection of Roman antiquities.

50.

AGNA or **AGNUA**, also written **ACNA**.

AGNAPTOS, **AGNAMPTOS** or **ACAPTOS**, built in the Altis, at Elis, a portico, which was called after the architect "*ἡ ἀγνάπτου στοί,*" even in the time of **PAUSANIAS**, *Descr. Gr. v. 15, vi. 20*.

AGNELLI (**GULIELMO**). A pupil of Nicola da Pisa, built the façade of the church of S. Michele in Borgo, and that of the Dominican monastery of Sta. Caterina, at Pisa, which was finished about 1252. Both are adaptations in the pointed style of the Duomo; but the second work is an example of the churches without aisles, which were built for the preaching friars.

28.

AGNOLO, (**BACCIO D'**), born 1459. In his youth he excelled in inlaid works, and executed, at Florence, besides some coffers in walnut-wood, a large picture-frame, described by **VASARI** in his life, the stalls in the choir of the church of Sta. Maria Novella, and the carved ornaments of the organ in that church, with those of the high altar in the church of the Annunciation: these last were laid aside when the altar was remodelled, at the cost of the son of Vitale de' Medici; he also executed the decorations of the organ in that church, with many other works in public and private buildings in his native city. After studying the antiquities of Rome, he returned to Florence and erected several of the triumphal arches on the occasion of Pope Leo X's arrival, at which time his opinion was sought on the designs for the magnificent buildings erected in that city. He took part with Pollaiuolo, and others, in the deliberations with regard to the great hall of the palace, and in erecting its steps, with their decoration in stone-work, as well as the columns of variegated marble, and the marble doors of the hall called del Dugento. He designed, in 1520, the gardens in Gualfonda, for Giovanni Bartolini, and for the same client, the palazzo which was finished with elaborate interior decorations, on the Piazza di Sta. Trinità. This was the first palazzo erected in Florence with square windows having pediments, and with a portal, the columns of which supported an entablature, and was not altogether approved, because these features had previously been reserved for churches. The external cornice, copied from an antique cornice since destroyed, in the Colonna gardens at Rome, was still less admired, as being over large; but, notwithstanding this defect, the palace was afterwards measured and delineated, that a similar one might be constructed for the Duke de Retz, in the Rue

Montmartre, at Paris. He directed the construction of a palace on the Arno, between the Trinità and Carraja bridges, for Lanfredino Lanfredini; on the Piazza de' Mozzi he began the mansion of the Nasi family; he built a mansion on the Via Ginori, for Taddeo Taddei, now called the Peiori-Giraldi palace; he designed the villa on the heights of Bellosguardo, for Pier Francesco Borgherini, now belonging to the Castellani family; and for the same client made the plans for the mansion in the Borgo Sant' Apostolo, now belonging to the Rosselli. **VASARI** also mentions, with great approbation, an anteroom built for Giovanna Maria Benintendi. The Campanile of S. Miniato-in-monte, was executed, and that of Santo Spirito at Florence was commenced by him, and his last work was the portal of the church of S. Giuseppe, at Sant'Onofrio, having previously made the model for the entire building. He was consulted upon the designs for the façade of the church of S. Lorenzo, and made the wooden model of that by Sansovino which was preferred; he directed the mechanical contrivances for the transport and erection of the colossal group of Hercules and Cacus, in conjunction with Antonio da San Gallo, (for at this time they were both architects to the cathedral); and gave the designs for completing the entablature and gallery round the bottom of the cupola of Sta. Maria del Fiore, those of Brunellesco having been lost; he commenced in Carrara marble only part of that gallery looking south-east and towards the palazzo Guadagni, (now Riccardi), Via del Bischeri, (now dei Balastrieri), but was stopped by the influence of M. A. Buonarroti, so that this part of the work has never been executed. He afterwards gave his attention to the renewal of the choir; to completing the pavements in the choir, after the designs of Brunellesco, and to the other buildings, which had been committed to his care, such as the principal monasteries and convents in Florence, as well as numerous houses belonging to the citizens, both within the city and without. He was chosen with M. A. Buonarroti as arbitrator of the value of the works of Rustici, at Florence. Retaining the firmness and clearness of his faculties to the last, he died in the year 1544, aged 85, leaving three sons, Giuliano, Filippo, and Domenico, and was buried in S. Lorenzo. His style is exhibited in several of the plates of **RUGGIERI**, *Studio d'Architettura Civile*, etc., fol., Firenze, 1722-8. The triumphal arches for the entry of Charles V into Florence, were erected by him, with the assistance of his son **GIULIANO**.

3, 73.

AGNOLO (**DOMENICO D'**). A son of the preceding **BACCIO**; was also a wood carver, as well as an architect. He died early, after having shewn great promise in the mansion erected from his designs for Bastiano da Montaguto, in the Via de' Servi. He completed the angles of the Piazza de' Mozzi, for Agostino del Nero, and built a terrace for those houses of the Nasi family which had been commenced by his father.

73.

AGNOLO (**GIULIANO D'**). Another son of the preceding **BACCIO**. Besides wood carving, he gave more attention than his brothers to architecture. He therefore succeeded the father in the works of Sta. Maria del Fiore, and continued all that he had left in hand; not only in that fabric, especially the pavements, but in other buildings. His own works were a chapel and house for Baldassarre Turini, at Pescia; a small house at Montughi, outside Florence, and a larger one at Colle, for Francesco Campana; a palazzo, *al Tedesco*, for Messer Ugolino Grivoni, Signor of Altopascio, and the restoration of a house in Florence for Giovanni Conti. The alterations in the great hall of the palazzo Vecchio at Florence, which was finished by **VASARI**, were designed by him for Bandinelli, and also from whose sketches he made the model for the high altar, and the marble decorations of the choir of the cathedral. **VASARI** (in *Vita*) mentions particularly several of the wood carvings executed by Giuliano, who died in 1555.

73.

AGNOLO (**GABRIEL D'**). He studied the architectural antiquities of Rome about 1480, was a rival of Novello di S. Lucano, and Gio. Fr. Mormando; designed the palazzo Gravina (unfinished), erected the churches of Sta. Maria Egiziaca and

S. Giuseppe, and some other public buildings at Naples, and died about 1510. 36.

AGNOLO (MICHEL); see BUONAROTTI.

AGORA (Gr. ἀγορά). The public place contrived in the midst of Greek cities. According to VIRUVIUS, vi, 7, it was generally square; many, however, were subordinate to the shape of the site. All were surrounded by colonnades (στοῖαι) formed of single or double ranges of columns, and terminated above by terraces. The ancient agorai were not confined by continuous porticoes, as they were traversed by streets: such, amongst others, was the public place of Elis, mentioned by PAUSANIAS, vi, 24, who describes it as quadrangular, and called a hippodrome, because used for horse races. The agora was the place in which public assemblies were held, as well as a market for the sale of goods; in this respect the use of the English market-places at elections offers a complete parallel; and the usual situation of the Town Hall in those market-places recalls the use, as at Megalopolis and Athens, of a portion of the porticoes for the purposes of a tribunal. Like the Roman forum, the agora contained temples, altars, and statues of the gods, heroes, and distinguished citizens. Some of the porticoes were decorated with pictures, and were then styled PŒCILES (ποικίλαι); only very incomplete vestiges remain of these buildings, either in Greece or in Asia Minor. 51. 78.

AGOSTINO and AGNOLO; see SIENNA.

AGRA or AKBARABAD. The capital of the province of the same name in Asia, so called in Hindostanee; it still retains much of its original splendour, although the effects of European visits have not improved its appearance, as some of its best buildings have been dismantled. Besides its many public baths, caravanserais, and mosques, the most remarkable edifices are the imperial palace built by the emperor Akbar, who refounded the city; the Mootee musjed, or pearl mosque, so called from being constructed of white marble (both now used as offices, government stores, lodgings, and private warehouses); the mosque called Jumna musjed; the tomb of Etimad-ul-dowlat; and the celebrated Taje-mahal or Taje, i.e. crown of edifices, built by the emperor Shah Jehan, in the seventeenth century, in memory of his favourite queen Noorjehan. Until its not very recent dilapidation, this was the most superb edifice in India, and perhaps, of its kind, in the world. It stands on a terrace of white and yellow marble, supported by red sandstone walls, and has the form of a quadrangle 570 feet on each side, with a lofty dome of 70 feet in diameter in the centre; tall minarets rising from the angles of the building, give stability and lightness to the dome which covers the monuments of the founder and his queen. The walls are of pure white marble, made still whiter in appearance by contrast with the various coloured marbles with which the hall is paved, and by the introduction of lapis lazuli, jasper, and cornelian, in mosaics: specimens of which, taken from the quantity removed from the building to adorn a bath in England (and sold in pieces at the Custom-house), have been presented to the Royal Institute of British Architects. It is stated in MURRAY, *Handbook for Northern Italy*, that the workmanship of the inlaid *pietre dure* of the altars at the Certosa, at Pavia, "is exactly like that of the Taje-mahal, which was made by Italian artists, but there is as much here as would make ten of the tombs at Agra." This assertion may be founded on some tradition, but the Hindoos excel in this *pietre dura* work: they also work the perforated walls peculiar to the houses and palaces of India, which walls, although in some cases three feet in thickness, have all the light appearance of arabesque work with its foliage and grotteschi, and admit that perfect ventilation from chamber to chamber, and from hall to hall, which is essential in the heated atmosphere of the country. It is stated that these beautiful works are the productions of female hands; and in many parts of India the natives may daily be seen engaged in the inlaid or *pietra dura*, and perforated works. The chambers and corridors, which surround the hall, are finished like the central saloon, and the

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whole work is stated to have cost £750,000, PENNY CYCLOPÆDIA, or 3,174,802 dollars, BLACKIE, *Imperial Gazetteer*. The quadrangular monument is surrounded by a beautiful garden, with white marble fountains, in the eastern style: the British government now keeps the whole in good order. The city was well described by BERNIER, *Travels in the Mogul Empire*, 8vo, Lond. 1826. The houses, chiefly built of stone, are generally rendered very lofty, by the number of the stories, and the streets are extremely narrow. In the vicinity of Agra there are many splendid remains of Indian art. AKBARABAD. W. H.

AGRAFE or AGRAFFE. A French word, implying a hook used by builders for the small cramps employed in fixing chimney-pieces, and for the small tongues or strips of lead or zinc, by means of which the sheets of metal are fixed to the boarding or battening of a roof. G. R. B.

Its more extended meaning, and that in which it is employed by modern writers, is the voussoir and keystone of an arch, especially when carved as a cartouche. In Normandy some arches of the Romanesque style are found decorated with an ornament, which it is difficult to describe, otherwise than as a torus or boltel, attached to the archivolt ground by a sort of agrafe. 51.

AGRAM or ZAGRAB (in Latin, *Zagrabia*). A city in Hungary, divided into three portions, viz., the free or upper town; the lower, or chapter town; and the bishop's town. The streets of the first are regular and well built, many of the houses being in the Italian style, with flat roofs; and it contains the Government-house, in which the Diets are held. The episcopal palace, a mediæval castellated edifice, with round towers considerably modernized, adjoins the lower town, as does the cathedral, which is both lofty and spacious; the front is in the Byzantine style of the eleventh century, but the body is of a later period: the coloured glass in the great east window is modern and recent. The "Narodne Domo," or national casino and club-house, a new structure in the Palladian style, contains a museum, and the rooms of the Agricultural Society. The other remarkable buildings are an institution for Sisters of Charity, which includes, besides the church and dormitories, a hospital and school; two theatres; the public and the cathedral libraries; an orphan institution; a civil and military hospital; a royal academy; primary and preparatory schools, and a theological seminary. 50.

AGREEMENT. (It. *accordo*; Sp. *acuerdo*; Fr. *accord*; Ger. *einklang*). A term used to express that the particular character in one portion of a building accords with that of another; it also includes the idea of concordance of minor parts, as of an entablature with its columns; and of congruity, as of a style with the destination of a building, or of sculptured decorations with the character of the architectural portion of the work.

AGRICOLA or AGRICOLA (SAINT), bishop of Chalons-sur-Soâne, in the sixth century, bestowed much attention upon the churches which he caused to be built, especially of his cathedral, enriched and ornamented by him with columns, marbles, mosaic work and paintings. He died 18th March, 580, aged 83. S. GEORGI FLORENTII GREGORII, *Ep. Turon. Hist. Fran.* v, 46.

AGRICULTURAL COLLEGE. A building in which pupils receive instruction in practical and theoretical agriculture. Any complete edifice designed for such a purpose, should contain, besides the entrance halls, steward's, housekeeper's, and servants' rooms, vestibules, and corridors, the dwellings of the principal, and such of the professors or teachers as may be necessarily resident; with bed-chambers, a refectory or dining-hall, a parlour or reception room, and a place of assemblage for religious worship, for the students. Besides this, which may be considered the domestic portion of the establishment, there should be the necessary lecture-rooms, for the teachers of surveying and accounts; of building and mechanical engineering; of botany and geology; of chemistry and medicine; of law;



and of practical farming. These lessons require the additions of a museum of botany, geology, anatomy, and agricultural models, with a library and draftsman's room; and attached to the building there should be a complete series of the buildings comprising a FARMSTEADING, and a good botanical garden. In some of the foreign establishments, a distillery and a brewery are classed among the necessary offices.

14. AGRIGENTUM, also ACRAGAS or AGRAGAS, the ancient names of GIRGENTI, in Sicily.

AGRIPPA (CAMILLUS). A distinguished Milanese architect of the sixteenth century, published three works on subjects of philosophy, and military and civil engineering; and a *Trattato di trasportar la guglia in su la piazza di S. Pietro*. 4to, Rome, 1583; all his books are very scarce. (See FONTANA.) 83.

AGRIPPA (M. V.), see VIPSANUS.

AGRIPPINA COLONIA, the ancient name for COLOGNE.

AGROLAS, according to Bekker (PAUSANIAS, i. 28, 3,) or EURIALUS as given by PLINY, vii, 56, was the name of the brother or companion of HYPERBIUS.

AGUAS (MIGUEL) designed, in 1736, the collegiate church of the city of Alcañiz in Arragon, and carried on the works for three years. 66.

AGUDO (MAHOMED), was *maestro mayor* in Cordova, in the year 1477. 66.

AGUERO (FRANCISCO DE), see CAMPO-AGUERO.

AGUERO (JUAN MIGUEL DE) was employed on the fortification of the Havannah, and afterwards resided in Merida of Yucatán in the year 1585, and directed the progress of the cathedral, until its completion, when he was rewarded with a pension. 66.

AGUILAR (JUAN DE) was employed in 1636 by the infante Don Fernando, brother-in-law of Philip IV, to erect the rural palace called La Zarzuela, about six miles from Madrid. 66.

AGUILAR DE LA FRONTERA. A considerable town in the province of Cordova in Spain, divided into the lower and upper towns, the last being emphatically *la villa*, from having contained the principal buildings. The place is remarkable for the cleanliness of its streets, and for the whiteness of its houses, many of which have three floors, one of these is always used as a granary. The chapter-house, prison, fishmarket, abattoir, and new town hall, are of good modern construction: besides these there are a dismantled but strongly-built Moorish castle, the old town hall, a subterranean prison, a church, several chapels and schools, a hospital for the wandering poor, an infirmary, and three plazas. 50.

AGUILLA (It. *aguilia*; *guglia*; Fr. *aiguille*). The late Latin term for an obelisk, or spire of a church tower. 80.

AGUIRRE (MIGUEL DE). He was engaged as *aparigedor*, from 1534 to 1538, upon the works at the cathedral of Salamanca, Rodrigo Gil de Hontanón being *maestro-mayor*. 66.

AGUIRRE (PEDRO DE). In 1585 he finished, with Pedro de Abril, the cloister of the cathedral at Cuenca. 66.

AGUSTIN (DON ANTONIO) is supposed by some authors to have designed and erected a handsome chapel in the cathedral of Tarragona. 66.

AGYIEUS (Gr. *αγυιεύς*). A statue or an altar of Apollo, as guardian of the streets and public places. It was generally put at the street door of Greek houses, and at the centre door of the scena of Greek theatres. The assertion deduced from a seeming analogy with the Greek term *αγυιεύς* (from *α* and *γυιεύς*), signifying without limbs, appears to be improbable.

AGYLLA, in the Papal States; see CERVETERI.

AHADKOL, in Anatolia; see TRAJANOPOLIS.

AHERON (JOHN) is the signature to a manuscript, executed in imitation of type-printing, in the British Museum (*Bib. Reg.* 282-273 r), entitled *A general Treatise of Architecture, divided into Five Books*, etc. It consists of 176 folio pages, with the epigraph, "This work was written and drawn with pen and ink and finished the 13th of April, A.D. 1751, by John Aheron." The author seems to have practised in Ireland, as three of the drawings relate to houses in that country, and a partially expe-

rienced eye can discern in the erasures at the end of the preface, the words "Sir Edward O'Brien, Baronet" — "Dromoland"; this gentleman, apparently an early patron, was to have been highly complimented for his architectural designs, and for his improvements on that estate in the county Clare; the only other address in the work, is that of Poole Cosby, Esq., attached to a design for the east front of Strabally Hall, in Queen's county. The drawings, some of which exhibit vast buildings (one having the date 1743), show great superiority over the general designs of that period; and the text is well selected and arranged.

AHGUILB. An abundant wood, native of Travancore, East Indies; of a light yellow colour, used for upholstery. 71.

AHMEDABAD. An ancient city of the province of Guzerat; was founded by Ahmed Shah, 1411-43, who erected many mosques; it was formerly one of the most opulent cities of Hindostan, and celebrated for its buildings and handsome streets; but the great earthquake of 1819 destroyed a large portion of the most remarkable edifices, including the great mosque of Sultan Ahmed, erected about three hundred and fifty years previously. 50.

AHMEDNUGGUR, the capital of the province of the same name in Hindostan, was founded by Ahmed Nizam Shah, who made it the capital of his dominions, in 1493; it is remarkable chiefly for the mausoleum of Salabat Jung, and for the ancient palace of the Sultans. It contains some well built streets, and a good market.

AHOO. A native wood of Ceylon; is soft, though fine, but not very close grained, light, and is used for building and upholstery. 71.

AHRLER (HEINRICH), of Gmünden, or Gemunden, in the kingdom of Württemberg, is said to be represented in a bust in the lavatory of the Certosa, at Pavia, there being a tradition that it is the portrait of the architect of that church, of which the design is attributed to Ahrlér or to Marco di Campione; and the first stone was laid 8th Sept., 1396. There is, however, little doubt that he was the architect of the Duomo at Milan, perhaps from the laying of the first stone, 15th March, 1386, to the year 1400. His name is altered by the Italians into Enrico di Gamodia, or Zamodia. Woods, *Letters of an Architect*, etc., 4to., Lond., 1828.

AHRWEILER. A town in the province of the Lower Rhine in Prussia; has four gates, a church, a chapel, and a cathedral dating from the middle of the thirteenth century. T. H. L.

AICARDO (GIOVANNI), born at Cuneo in Piedmont, about the year 1550; was employed at Genoa in the construction of the public granaries near the Porta di S. Tommaso, several dwellings, and the palazzo Serra in the Piazza dei Bianchi; the choir of the church of S. Domenico was remodelled, and the aqueduct which supplies the city was begun by him. He died in 1625. 37.

AICARDO (GIACOMO), son of the preceding GIOVANNI, completed the aqueduct for Genoa, which was nearly finished at his father's death. He executed the fountain near the Ponte Reale; altered that bridge, and the Ponte dei Mercanti, or Mercatori; and erected several buildings, such as the salt magazines, &c. The Strada Ronda, and a portion of the walls following the line of the harbour, were also constructed from his designs. He died in 1650, aged about 70. 37.

AICHL (JOHANN SANTINI), in practice at Prague, died there in 1723, aged 56. 26.

AICHSTET, or AICHSTADT, is now written EICHSTÄTT or EICHSTADT. 14.

AIDIN, IDEN, or GUZEL-HISSAR, the ancient TRALLES, a town of Anatolia, in Asia Minor, is a place of great trade, four miles in circuit, the streets of which are formed by bazaars, shaded by trees. It contains many churches, synagogues, and fine mosques. The ancient city was situated on the side of the mountain, at a slight elevation. At this height there is an uninterrupted level space, formerly occupied by a

part of the town, containing many ruins; a large fragment of three arches and piers, constructed of stone, with vaultings in brick, forms an imposing mass, but nought can be made out of the heterogeneous masses which surround it. Higher up the hill, to the north, at almost ten minutes' walk from this, is the theatre, one of the largest in Asia Minor. On a level with the upper part of the theatre are some ruins, apparently of a gymnasium; and behind the scena, and at right angles to it, is a stadium, which combines gracefully in plan with the theatre. At the western end of the stadium, is an arrangement of plan with niches, forming a species of fountain, into which the water even now flows. These ruins lie on the top of the mountain, to the west of the ravine, and above what is called the castle. T. L. D.

AIGLE. The capital of the district of the same name in the Pays de Vaud, Switzerland, is interesting on account of its houses, which are built of unpolished black marble quarried in the vicinity. It is a walled town, with six gates, and contains three parish churches, two monasteries, and a hospital. The seignorial chateau is remarkable for its beauty. 74.

AIGNER (.....). He is described as being of Gallizia in Austria, between the years 1808 and 1812. The churches of S. Alexander, (1814), and S. Andrew, the observatory, guard-house, government palace, (1823), and the completion of the mint at Warsaw, are described, s. v. in the *Penny Cyclopædia*, and attributed to an architect of this name. *NAGLER, Lexicon*, s. v. mentions a history of the art written by Aigner for an Architectural Dictionary, and also specifies a few works of minor importance.

AIKIN (EDMUND). The youngest son of John Aikin, M.D., was born at Warrington, 2nd October, 1780. He published before 1813, in concert with General Sir Samuel Bentham, to whom he was then assistant, the designs for a bridge erected over the river Swale. He furnished the designs for the Presbyterian chapel in Jewin Street, London, and for several buildings in Liverpool, where he settled about the year 1814, on having to erect the Wellington Assembly Rooms. He wrote many of the early architectural articles for Rees' Cyclopædia; several minor works; *Designs for Villas and other Rural Buildings, with—Remarks on the Prevailing Defects of Modern Architecture, and an Investigation of the Style best adapted for the Dwellings of the Present Times*, 4to. Lond. 1808; and an *Essay on Modern Architecture*, 8vo. 1808; and an *Essay on the Doric Order*, fol. 1810, both of which were published by the Architectural Society; *An Account of the Cathedral Church of St. Paul*, in 1813, for Britton; *Remarks upon the Architecture of the Reign of Queen Elizabeth*, appended to his sister's *Memoirs of the Court of that Sovereign*, 1818. He died at Stoke Newington, during a visit to his father, 11th March, 1820. *LUCY AIKIN, Memoir of John Aikin, M.D.*, 8vo. Lond. 1823. i, 267-272.

AILANTHUS GLANDULOSUS. In Amboyna, it is called the 'tree of heaven', on account of its lofty growth, and, though a native of China, it grows very fast in this country, and is recommended for plantations. The wood is hard, heavy, and glossy, resembling satin, and in Tuscany (*ailanto*) it is used in construction and for furniture. It is also grown in America; and a species *A. excelsa* (*peroo marum*, and *pethavkoo kurra*) is found in the woods of Coimbatore, East Indies. 71.

AILE, or **AISLE**, **AILEY**, **ELÉ**, **ELYNG**, **HELE**, **HYLING**, **ISLE**, **YLE**, as the word is found written in old English documents. (It. and Sp. *ala*; Fr. *aile collateral*, *bas-côté*; Ger. *flügel*, *seitenchor*, *seitenschiff*.) A wing, or any part of a building flanking another: in this sense the French say *ailes de bâtiment* for "wings of a house". The term has been improperly applied to the nave of a church, which is then called the middle aisle, but the name is properly only given to the lateral portions or side passages, which are generally partially separated from the nave and choir by arcades, columns, or piers. In England, examples abound of churches with one aisle; and there are few cases of more than one aisle on each side; but

the GLOSSARY gives instances of two aisles on one side and only one on the other, as at Collumpton, and Ottery S. Mary, Devon; Bloxham, Oxon; S. Mary Magdalene at Oxford; and Yelvertoft, Northamptonshire; on the Continent, two aisles on each side, as at Ulm, Amiens, and Milan, are not uncommon; Notre Dame at Paris, has three aisles on each side; but, in England, the church of S. Mary at Taunton, and Chichester cathedral, may be mentioned as the few instances of two aisles on each side. At Durham, Salisbury, and other places, the transept has an aisle only on one side of it; but at Ely, S. Mary Redcliffe at Bristol, Winchester, Westminster, Wells, S. Paul's at London, and York, the aisles are returned on each side of the transept. The great mosque at Cordova appears to have been originally about 157 feet wide, with eleven aisles, and 337 feet long, in thirty-three cross aisles; the width was subsequently increased by the addition of eight more aisles. ALA.

AILECH. The Glanion is situated within four miles of the city of Derry, in Ireland. It is one of the most remarkable of the primeval fortresses of that country, having considerable remains of its walls, which were constructed with stones, mostly of polygonal form, and hammer dressed to fit, without any cement, as is usual in such works in that country. R. R. B.

AILLERON. A French term for the half gable of the roof of an aisle. When the architects of the 17th and 18th centuries deemed it desirable to mask these parts, as well as the buttresses to the nave walls, and to give a pyramidal outline to their elevation, the word was applied to the enormous reversed trusses, consoles, or scrolls, such as are to be seen on Templebar, London, and many churches of that period. The most remarkable instances are perhaps those executed at the church of the Salute at Venice; and by Algardi on the church of S. Ignazio at Rome, where he made the upper part of the scroll to terminate in a human head, supporting a capital. The word aileron is likewise applied to the console finishings, and to the scroll terminations of dormer windows. 25.

AINTAB or **AENTAB.** The capital of the district of the same name in Syria, is tolerably well built, and contains perhaps 3,000 houses, principally of stone, five fine mosques, several baths, an Armenian church, good baths, a picturesque citadel, and a spacious cemetery, in itself almost a suburb. The town is well supplied with water, which, it is said, runs in copious streams through the streets. Much pine wood is cut in the mountains, and sent to Aleppo. 50.

AIR, LIGHT, etc. Rights of air, etc., exist in law, like rights of way over property adjacent to, but not belonging to the proprietor. They are now (by statute), acquired by twenty years' usage, uninterrupted for a space of one year, which, however, as well as the occupation, may be expressly agreed upon, but a mere payment does not concede the right. If the dominant and servient tenements become the property of one individual, the right ceases, renewable of course on the original period of use. It is confined to the original extent of opening, and for the original purpose; a malt-house cannot claim to be converted into a dwelling. Boards may be put up under a window, not excluding the light. The infringement of the right is an appreciable diminution of comfort or utility; this a jury estimates in the best way it can. The statute overrules any local custom, as of London, but only provides for buildings, not for open ground, which is left to immemorial prescription. T. T.

AIR BRICK. An iron box used in walls, and usually made to the size of a brick, but with one of its faces formed into a grating. The object of the grating is to permit the passage of air through the air-brick into the air-hole or drain, for ventilation, and yet to keep out reptiles, birds, etc. The ordinary size is 9 ins. by 3 ins.; the half-brick size is 4½ ins. by 3 ins.; and there is also an extra large size, 9 ins. by 6 ins. on the face. For the sake of economy, the bottom, and by some makers the top also, is partly cut away. The prices are in the ratio of 5, 4, and 8.



AIR DRAIN. A tube or other means of conveying the external or atmospheric air to the underside of the grate of a stove or furnace; the term is frequently though erroneously applied to a DRY AREA.

AIR ESCAPE, or VENT (Ger. *Luftöhre*). A mode, consisting of a tube, with or without a tap or valve, for passing air from water-pipes without allowing the escape of water; air would otherwise collect in the higher levels of pipes, and obstruct the passage of the water. G. R. B.

AIR HOLE. (It. *spiraglio*; Sp. *respiradero*; Fr. *soupirail*; Ger. *Luftloch*.) An opening in a wall for the admission of air, either to an air-drain, a floor, or a room; the little openings in turrets and stair-cases often offer many suggestions for the protection, by perforated panels, of such a mode of ventilation. Several examples exist of air-holes so contrived as not to admit light.

AIR MACHINE. The apparatus employed to force pure air into an apartment, chamber, mine, &c., or for the purpose of extracting the foul air. See *Treatise on VENTILATION*. G. R. B.

AIR PIPE. This was the denomination given about sixty years ago, to the invention of Mr. Sutton, a brewer in London, for drawing foul air out of close places by means of fire, and from him they were called Sutton's air-pipes, when they were applied at first to ships. His contrivance was to feed a furnace with air by means of only one tube brought from one point; into which tube others, from separate rooms, might be conducted. The principles, that air is necessary for the support of fire, and that it will reach the fire from the most distant points that can be selected, have since been applied to the ventilation of buildings; the difference between air-drains and air-pipes or tubes seems to be, that the latter are appropriated to conducting foul air from apartments to the distant furnace. 44.

AIR SHAFT. The leading channels through which the foul air from large buildings, the holds of ships, &c., finds its exit: the pit for the supply of mines with fresh air is also called a shaft. Small air shafts from the king's chamber of the Great Pyramid at Gizeh keep up a constant circulation of air.

AIR STRAINER. An apparatus for admitting air into apartments, and at the same time depriving it of blacks, dust, and damp. Such a machine, invented by Mr. Scott of Exeter, is described in the *BUILDER Journal*, ix, p. 672.

AIR SYPHON. A bent tube, of which one leg is longer than the other, and placed with the ends upwards. This inverted syphon was suggested and recommended for ventilation by FREDGOLD, *A Treatise on Warming*, etc., 8vo. London, 1824, p. 239. The system was patented, in 1849, by Dr. Chowne, and observations thereon will be found in the *BUILDER Journal*, vols. vii and viii, and in other periodicals for the years 1849 and 1850.

AIR TINT. This term expresses the peculiar tone which affects the natural colour of an object, according to the length and rarefaction or density of the column of the atmosphere interposed between the object and the eye. **AERIAL PERSPECTIVE.**

AIR TRAP. Any contrivance for preventing the escape of foul air from a sewer, drain, &c. It is also, and more properly, known as STENCH TRAP.—TRAP.

AIR TRUNK. (Lat. *spiraculum*; It. *spiraglio*; Fr. *ventouse*; Ger. *öffnung*.) A square wooden tube, forming a direct communication from the ceiling of an apartment to the open air. This simple but effective mode of in some degree ventilating close places, was apparently not used before Dr. Hales introduced it to prevent the stagnation of putrid air in jails, and other places: its success is shown by the fact that, at the old Houses of Parliament, one pan of a pair of scales which was two inches in diameter being placed in such a trunk, the force of the ascending air equalled the weight of four grains, but when one of the Houses was full, twelve grains were required to keep the beam of the scales level. HALES, *A Treatise on Ventilators*, 8vo, London, Part I, 1743, and Part II, 1758.

AIRE-SUR-L'ADOUR. A city of the Department of Landes

in France; it is well built, and contains a college; church of S. Pierre; and the cathedral, dedicated to the Virgin. The pillars and large arcades of the transept, with the two chapels behind the altar, are stated by BOURASSÉ, *Cathédrales de la France*, 8vo, Tours, 1843, to be in the style *Romano-byzantin*, while the rest of the church is modern. There is also a fine hôtel-de-ville, surmounted by a belfry; and fine barracks.

AISLE, more properly **AILE**.

AIX. (AQUE SEPTIE of the Romans.) This city, in the Department of the Bouches-de-Rhone in France, was formerly the capital of Provence, and the narrow streets of the "old town" still exhibit portions of their mediæval walls and gates. The modern town consists of straight and well paved streets; and two of them, the Cours de S. Louis, and another called indifferently the Cours, or the Orbitelle, are particularly mentioned as very superior to the streets of most French cities: the Orbitelle is lined with handsome modern houses; it is closed at one end by an iron railing, and is ornamented by three fountains, on one of which is a statue of the Bon Roi René. The cathedral of S. Sauveur is described by BOURASSÉ, *Cathédrales de la France*, 8vo, Tours, 1843, as consisting of one north aisle, in the modern *Latin* style; a roofless octagonal belfry, and a great west entrance in the style *ogival tertiaire*; a nave in the style *ogival secondaire*; and a south aisle in the style *Romano-byzantin*. To these may be added the recently restored baptistery, having a number of antique polished granite pillars supporting round arches, and the cloister which is remarkable for the variety of columns supporting it; both buildings seem to belong to the twelfth century. The carved cedar (walnut?) doors were executed in 1503. The palais, a very old building, with several large halls, in which the parliament of Provence used to assemble; the clock tower (1512) in the market-place; the Gothic church of S. Jean, with the monuments of the Counts of Provence, close the list of antiquities; the city also possesses a new church called the Madeleine; a public library; an academy; a museum of natural history, and also another of antiquities which is in the Town-hall; the mairie; a theatre; baths; two hospitals, and a lunatic asylum; as well as many smaller establishments for the arts and sciences. The troubadours, the university, and the patronage of Louis XV, rendered it one of the most celebrated cities of France; a distinction which it still retains.

AIX LA CHAPELLE. Usually called in Germany AACHEN, was formerly the AQUIS-GRANUM of the Romans, and owes its eminence to Charlemagne, who is supposed to have been born, and who certainly died there. He made it the second city of his empire, and built, 796-814, "the chapel" after which the town is called; its site is now occupied by the nave of the cathedral. The original church was destroyed by the Normans, and rebuilt in its present form, (an octagon internally, but on the outside a polygon of sixteen sides,) by the Emperor Otho III, in 983-1002. The chandelier of silver and brass, richly gilt, having sixteen turrets, surrounded with forty-eight statues, each twelve inches high, with thirty-eight lesser figures, and forty-eight (modern) candelabra, affording, on state occasions, the blaze of 450 tapers, was the gift of the Emperor Frederic Barbarossa, 1152-1190. The brass doors and rails, and the throne on which Charlemagne's body was found seated in his coffin, in 997, are remarkable. This throne is placed in the gallery of the nave, which is now again adorned with some of the thirty-two porphyry and granite pillars, brought by Charlemagne partly from the exarch's palace at Ravenna, and partly from the East; they were taken to Paris at the beginning of this century; and some have now been replaced here; the others having been supplied by the King of Prussia. The choir was begun in 1353, and finished in 1413: it is 114 feet high, and remarkable for the quantity of space given to the windows. The city is divided into the outer and inner towns; the streets, especially the new street, are well built, and adorned with many ornamental fountains, the most decorated of which is that of bronze, twenty-four feet in

interior diameter, placed in the market-place in 1620; a bronze statue of Charlemagne in armour, has since formed part of the fountain. The senate house, or hôtel-de-ville, Rathaus, in the market-place, has a front 174 feet long, and is 70 feet deep, with three stories in height. It was erected, in 1353, on the site of a palace in which Charlemagne was born, and is flanked by two towers, of which the semicircular one at the west end belonged to the old palace; that at the east end was built in 1215. The building was repaired and improved in 1843, according to a description and plan given in the *BAUZEITUNG Journal*, p. 152, for that year. It had been much altered by the previous restorations, consequent on the great fire of 2nd May 1656, which consumed twenty churches, and 5,000 houses. It is built of a freestone called ammitte, and is enriched with statues of the emperors who have succeeded Charlemagne, and with many historical paintings: the celebrated hall is on the uppermost floor; it is 162 feet long by 60 feet wide, and served for the emperor's reception of the iron crown, and his entertainments to the members of the Confederation and the citizens. This noble room was divided into four apartments in 1804.

The collegiate church of S. Adalbert (1002-1018), with sixteen other churches, and the old monasteries and convents, form the remainder of the ancient works of architecture. A public library, three hospitals, the gymnasium, the Elisenbrunnen or pump-room, the Redoute or gaming house, and a handsome theatre, are the other remarkable objects in the city: outside is the Cologne railway, starting with a viaduct, 892 feet long, and 70 feet high in the centre, and consisting of two tiers of fifteen small, and twenty large brick arches. Travellers hear but little of the once famous imperial abbies, namely, the Cistercian monastery, afterward a convent, of Borcette, Borzet, or Burtseheid, and the Benedictine monastery of S. Cornelis-Munster, in the immediate vicinity of this city.

W. H.

AIX LES BAINS (the Latin *AQUÆ GRATIANÆ*), near the lake of Bourget in Savoy, contains, among other Roman remains, a triumphal arch, an Ionic temple, a tolerably perfect vapour bath lined with bricks and marble, with its hypocaust and pipes; the modern buildings are the bath-house and casino.

28.

AIZANI or AZANI, an ancient city of Phrygia, has been an object of architectural interest since the year 1825, and is very fully described in the French government work by C. TEXIER, *Description de l'Asie Mineure*, fol. Paris, 1838. The principal ruins are those of the temple of Jupiter, the theatre, and the hippodrome. The temple stands upon an elevated rectangular platform, formed on the hill of the acropolis; and it is supposed that the peribolus, 270 feet long by 190 feet wide, was enclosed and ornamented with a double range of Corinthian columns, with the lower part of the flutings cabled. The eastern side of the substructure was decorated with ranges of eleven arches between pilasters, placed on each side of a central flight of steps, 99 feet wide, which formed the ascent to the platform. The edifice itself is more than half destroyed, but it was clearly Ionic octastyle pseudo-dipteral, with fifteen columns on the sides, and was about 130 feet long by 68 feet wide at the base of the columns. The whole structure is of white marble; each column, 29 feet high, is of a single block, and is remarkable for having a small vase sculptured in the upper part of each flute; the architrave, in three faces, is considerably deeper than the frieze; this last-named feature is most superbly decorated with acanthus leaves, placed at intervals like triglyphs, and the cornice has both dentils and modillions, a narrow corona and a very deep cymatium. Two Corinthian columns seem to have been in the posticum. Beneath the cella is an adytum or crypt, 52 feet long by 29 feet 6 inches wide, with a vaulted ceiling; the light was admitted by apertures in the pavement of the colonnade next the walls of the cella; and the steps leading to it were within the posticum.

The theatre is in better preservation than almost any other of the kind; it was 205 feet wide in its greatest diameter, with

ARCH. PUB. SOC.

seventeen rows of marble seats remaining; those of the upper tier are nearly destroyed, but its podium shows the peculiarity of niches placed at intervals in pairs. The orchestra was more than a semicircle, and had a radius of 67 feet. The scena was decorated with twelve Ionic columns in pairs, cabled at the bottom of the shaft, these are in fragments on the ground.

The stadium, which was attached to the south side of the theatre, measures 721 feet long and 146 feet broad, with two pulvinaria, or stands for the magistrates, and ten rows of seats along each side, which would accommodate about 12,000 persons.

The other ruins are supposed to be those of a basilica, or agora, to the north, and a gymnasium, south of the great temple, with a Doric colonnade still 246 feet long, with pillars of white marble, each in a single block. Two bridges, each of five semicircular arches, the parapets of the quays along the river Rhyn-dacus, and the tombs adorned with sculpture, all of white marble, are works of very considerable interest.

AJACCIO or AJAZZO. The capital of the department and island of Corsica, and the seat of a bishopric. It contains a cathedral (in the style of the *Renaissance Italienne*; BOURASSÉ, *Cathédrales de la France*, 8vo. Tours, 1843), a communal college, royal school of navigation, public library, and the house in which Napoleon was born. The principal streets are broad and straight, with well-built houses. A granite column, 106 feet 6 inches high, upon a pedestal, the first stone of which was laid 25th June 1837, surmounts the marble fountain in the Grande Place, and carries a statue of Napoleon.

AJAMBE. The French term for a window similar to the illustration. It differs from the usual French window, in having four or more casements, with separate hinges and fastenings complete, instead of two upright ones, which they generally have. The upper divisions are sometimes formed into one pane only, when more light is required, and symmetry not regarded. It is found to be more easily secured than the French casement with the upright meeting styles. The common English double-sash window is now becoming very general in France.

W. H.

AJARACA, also called ALMOCARABE. A term used in the south of Spain for an ornament in brick walls, formed of patterns, half brick deep, more or less complicate. The effect is good, if closely worked; but it is only fit, perhaps, for blank walls, and then forms a good preventative to the sudden abruptness of a large cornice. The Dominican monastery at Catalayud exhibits a good specimen.

J. B. W.

AJIMEZ, see AXIMEZ.

AJMEER or AJMERE, formerly the capital of a province of the same name in Hindostan, has arisen, since its possession in 1818 by the English, to the rank of one of the handsomest cities in British India. On the summit of the hill stands the fortress called Taraghur, which is nearly two miles in circumference, but is now going to decay: it contains a fane or temple, supposed to be one of the most ancient entire monuments of Hindu architecture. The old palace of Shah Jehan is still partly habitable.

AJUTAGE, often written ADJUTAGE (Fr. *ajutage*; Ger. *aussatz*). Writers upon hydraulics have lately applied this term exclusively to such additional tubes as increase the effective discharge of an orifice of a vessel, by obviating the diminution which would otherwise be caused by the contraction of the fluid vein. The form of the ajutage modifies the conditions of discharge in so remarkable a manner, and the phenomena connected with it are so interesting, that it appears desirable to adopt this exclusive acceptation of the word, considering the term JET to include the various methods of altering the form.

It is found that when water flows from an aperture in a thin plate, the real discharge is considerably less than that which would be indicated by theory, and the results obtained by the latter require to be affected by a co-efficient, whose value may vary between 0.705 and 0.572, according to the head and di-

mension of the orifice. If a circular tube of uniform diameter be applied to the orifice, it will increase the discharge; and the greatest increase is stated by EYTELWEIN to take place (at least for small pipes) when the length is to the diameter at least as 2 to 3, in which case the co-efficient becomes 0.82. If a tube be added, whose sides converge towards the interior of the reservoir, the co-efficient will be further increased; and when the length is made equal to 2.6 times the diameter of the extremity, and the sides converge at an angle of $48^{\circ} 50'$, it was found by M. CASTEL to be 0.984. VENTURI found also that, by employing an ajutage of the form represented by the accompanying sketch, consisting of two portions of cones meeting one another, so that the angle of convergence of their generating lines should be $5^{\circ} 6'$, the axis being common, and the length equal to nine times the smallest diameter, the effective discharge became 2.4 times that which could be obtained from an orifice in a thin plate, and with small pipes 1.46 times that indicated for the theoretical result according to the principle discovered by TORRICELLI, viz., that the fluid would escape with a velocity equal to that which it would have had in falling from the surface of the liquid to the orifice. G. R. N.

AKBARABAD, now called AGRA, received its original name from its founder, Akbar, the third emperor of the Moguls (1566-1605). The former magnificence of the city is best expressed by the European calculation, that before the year 1665 it contained 70 mosques, 800 public baths, 15 grand bazaars, and 80 caravanserais, etc. It fell into decay upon the creation of Delhi. 40.

AKE AKE or MOHOWRANGS. A valuable wood of New Zealand. 71.

AKHILZIK. A town in Russian Armenia, is the seat of a Greek archbishopric, and contains two Christian churches, a synagogue, and several mosques; that of Sultan Ahmed is built on the model of Sta. Sophia at Constantinople, and has a college and library attached to it. 50.

AKHISSAR or ACSA, the modern name of THYATIRA.

AKILAT, ACHLAT, CHALA, CHALATA, or KHELAT. A town on the north shore of Lake Van in Asiatic Turkey, and formerly the residence of the ancient kings of Armenia, still shows antique remains and the relics of the old city, destroyed by an earthquake in 865. The houses in the present town are built of stone cemented with clay similar to those of Bitlis or Bedlis. LAYARD, *Discoveries, etc.*, London, 8vo, 1853, especially notices some early Mahomedan turbehs or tombs built of sandstone, of a rich deep red colour, with conical roofs resting on arches, and columns with deep cornices intervening, formed of many bands of ornaments, each different from all the others. VISTAN.

AKHMIN, ACHMIM or ECHMIM, the modern name of CHEMMIS or PANOPOLIS.

ALA. This term, properly signifying a wing, is generally appropriated, in conformity with its use by VITRUVIUS, vi. 4, to the small recesses on each side of the further end of the atrium in a Roman house, which do not appear to have been sufficiently shut off from the atrium to have formed separate apartments. The word is also used according to BATISSIER as the equivalent of *pteron*, when employed by STRABO, *Geog.* lxvii, for the long wall on each side of the court in front of the pronaos of an Egyptian temple; and also for the lateral portico of a peripteral temple. PTERON.

ALABASTER, or ALABASTRITES, as it is apparently called by PLINY, and certainly by later authors, is the calcareous alabaster or calc-sinter, which is a stalactitic or stalagmitic carbonate of lime, found in masses in the cavities of calcareous formations, capable of receiving a marble polish, and named according to its grain and shades. Its specific gravity ranges from 2.4 to 2.8. *Antique, or Oriental, alabaster*, is semitransparent, yellowish white, and broken with milky white veins. The ancients procured it from the south coast of the Red Sea, and it

it was also found at Valencia, Alicante, and at Trapani in Sicily. *Veined alabaster*, or, *onyx marble* (It. *alabastro agatato*), is known by its parallel beds lying one upon the other, and very distinct, whether flat or contorted, transparent or translucent, and shading off from a honey yellow to a tint more or less pale. The structure is compact, and sometimes slightly fibrous, taking a semi-polish. It was obtained by the ancients from Arabia, Italy, Spain, and Sicily, and can now be procured in France. *Spotted alabaster* (Fr. *albâtre tacheté*) has neither bands nor zones, but merely irregular spots scattered over a yellowish surface. These were the varieties principally employed by the ancients, and as masses having the essential qualities for the determination of their species, are always tolerably scarce, the price of the alabastrites has always stood rather high. *Variiegated alabaster* (It. *alabastro fiorito*; Fr. *albâtre fleuri*) differs from the two preceding varieties, inasmuch as either the ground colour is intersected by different coloured irregular veins, or else the ground colour is no longer the principal feature, but is obscured by numerous spots or concentric zones, which fill up the spaces between the veins. Of this sort a large quantity was imported into England during the last century, from the grotto of S. Miguel in the rock, and to the west of the town, of Gibraltar, whence it was called Gibraltar marble.

QUATREMERE mentions that the alabastrites is cut into veneers, and that small veined pieces judiciously put together produce the same effect as that of choice woods in marqueterie: the pilasters of the gallery in the Villa Borghese are thus formed. The largest pieces of oriental alabaster which are known, are, the column 16 feet high, and two great tazze, 6 feet 8 inches diameter, in the Villa Albani at Rome, and the sarcophagus (in Sir John Soane's Museum in London), which is about 9 feet 4 inches long, 4 feet at the widest part, and 3 feet deep. ARRAGONITE. CIPOLLINO.

At S. Filippo, in Tuscany, moulds for bassi relievi are filled with alabaster by the sediment deposited from the water dropping into them from a stream naturally charged with carbonate of lime. The whole process as invented by Dr. Vegni is detailed by STUART, *Dict. s. v.*, with a notice that a similar operation is performed at Guanvasesica in Peru; but at this last place the objects need polishing after leaving the mould, which is not required by those of S. Filippo, these are finer in grain and whiter than Carrara marble. BEARD, *Traité des Pierres, etc.*, 8vo. Paris, 1808, describes them both as being a sort of *trufa*, although he includes them under the head of alabaster.

ALABASTER. Without a long series of inquiries and experiments, of which the necessity was not known until the commencement of this Dictionary, it is impossible to say whether the definition given in the preceding article, or that which will be found in the succeeding one, is to be applied in elucidation of the following notices.

Nero built with this material an *ædícula* to the goddess of Fortune in his golden palace, for the sake apparently of having a room which, although without windows, would be sufficiently lighted when the doors were closed.—PLINY, *Hist. Nat.*

In the apsis of the church of the convent of S. Miniato in Monte, are windows with the great singularity of being composed of translucent alabaster, one of the class included in the genus of the *Lapis specularis* of the ancients, each window is filled with a single slab, and are probably the *only* entire examples (for they are perfect,) remaining of this ancient mode of illumination. Many of those windows, which are not closed up, in the duomo of Orvieto, have diaphanous alabaster in the lower portions. GIRAUD DE PRANGEY, *Essai sur l'Architecture Arabe*, 8vo. Paris, 1841, mentions a similar instance at Corneto.

It will be seen from the paper contributed by Mr. Edward Richardson to the JOURNAL OF THE ARCHEOLOGICAL INSTITUTE, for June 1853, that, from the middle of the thirteenth century, alabaster came gradually into very general use in England, and a large list will be found of monuments executed in a material

so called. Pits exist at Chellaston near Derby, and at Fauld under Tutbury Castle. The use of it for architectural purposes seems to have been prevented in some degree by the introduction of gunpowder for blasting, which shattered and shook the material. At all events, it is probable that the working of alabaster for architectural purposes scarcely existed on a large scale in modern times, until the execution of the chimney pieces in Crewe Hall for the present owner. STUART, *Diet. s. v.*, states that the splendid inlaid columns in the hall at Kedleston are of Derbyshire alabaster.

The remarkably good condition of monuments and parts of monuments made of alabaster, while the grounds of Purbeck or other marble to which they were originally appended have become exceedingly deteriorated, renders an inquiry into the chemical composition of the works which remain, an object of special interest to the architect.

ALABASTER, or BASTARD ALABASTER (Fr. *faux albâtre*; *biscuit de Florence*), is the massive gypseous alabaster or gypsum, which is a natural semi-crystalline hydro-sulphate of lime, and not the calcareous alabaster or calc-sinter, which is a carbonate of lime, as described in the preceding article. It is easy to ascertain of which of the two kinds a vessel is composed, for carbonate of lime is hard, and effervesces if it be touched by a strong acid; but sulphate of lime does not immediately effervesce, and may be scratched with the nail. Its specific gravity is 1.9. Modern authors have made the mistake either of reversing the application of the names, or of calling the two substances by one term. As the two sorts are however confused by this kind of ambiguity, it would be well to use the ancient word for the calcareous alabaster, reserving the common name for the gypseous material, of which so many small ornamental objects are made. It is of so fragile a nature, that it may be said that artists have never employed it for great works; at least such is the opinion of BRARD, who specially mentions (p. 470) the statues and bas-reliefs of the tomb of the Comte de Lesdiguières in the cathedral of Gap, as being made of a gypseous alabaster from the quarry of Boscadon, near Embrun, in the Département des Hautes Alpes. The antiquities from Nineveh, in the British Museum, are also of this gypseous alabaster. It is found either granular or compact, and occurs in rounded masses, of from 20 to 2000 lbs. weight, in, or forming the lowest beds of a gypseous formation of the ordinary character. That of Volterra and Castellina is esteemed the best, on account of its superior whiteness, and fineness of grain; slightly coloured varieties, with accidental zones or veins, have been used, but they rarely succeed in imitating the alabastrites. The quarry, or rather mine, at Castellina, distant about twenty-two miles from Volterra, is described with much minuteness by HAMILTON, *Journal of the Geological Society*, 1845.

After the required form is obtained and smoothed down with pumice-stone, it is polished with a pap-like mixture of chalk, soap, and milk, and finished by friction with flannel; or the polish and satin lustre of the surface may be obtained by friction, first with soapwater and lime, and finally with powdered and elutriated talc or French chalk.

Dried shave-grass (*EQUISETUM*) is used to remove the asperities left by the hand or lathe, and the fine streaks caused by the grass are obliterated by means of slaked lime, finely pulverised and sifted, made into a paste, or putty, with water. Such articles as consist of several pieces are joined by a cement composed of quick lime and white of egg; or of excellent plaster of Paris mixed with the least possible quantity of glue water. When discoloured and injured, they may be washed with soap and water, then with clear water, and reworked with shave-grass, etc. Alabaster may be stained either with metallic solutions, with spirituous tinctures of dyeing plants, or with coloured oils, in the same way as marbles. A yellowish tinge is acquired in the course of years, however white the alabaster may have originally been.

ALABASTRUM. An unguentary or vase, chiefly made of

alabaster, for holding perfumes. PLINY, *Hist. Nat.*, xxi, 4, compares the form to that of an oblong pearl, and in that shape it is frequently seen upon tombs, tombstones, and medals.

ALAGOAS. A city and seaport of the province of the same name in Brazil, was once an important town, with houses built of stone, and generally more than one story high. It still contains eight churches and two convents, all handsome edifices. 50.

A-LA-GRECQUE. A term applied by the architects of the last century to one of the varieties of the ornament called the fret, used in cornices, floors, and other works, and frequently seen in the pavements of ancient Roman villas. 19.

ALAJUELA. A town of Costa Rica, in Central America, is one of the prettiest towns of the old Spanish settlements. The road, for two or three miles before entering the town, is lined with gardens and houses about 1000 feet apart, built of white-washed adobes, some of the fronts being ornamented with paintings. The houses of the better class are long and low, with broad piazzas and large windows. 50.

ALAMEDA. A public walk attached to most Spanish towns of Europe and America; generally ornamented with statues, fountains, &c., and furnished with stone seats. It is often planted with hedges of roses, and forms a delightful promenade in their season. This desirable place of recreation is set out and kept up at the expense of the township. The word may probably be derived from the Arabic, *almeidan*, an exercising ground or race-course. J. B. W.

LA ALAMEDA is also the name of an attempt at a villa built at an enormous expense in the environs of Madrid by the late Duchess Countess of Osuna. 28.

ALAN DE WALSHINGHAM, see WALSHINGHAM.

ALANGIUM HEXAPETALUM (*woodooya* and *akola*) is a useful wood of Cuddapah, East Indies. 71.

ALASHEHR, a city in Anatolia, see PHILADELPHIA.

ALATORIA, ALATORIUM, or ALORIUM, a piazza, corridor, or covered way; also the flank of a building. 80.

ALATRI. A city in the Delegation of Frosinone, in the Papal States, possesses a cathedral dedicated to S. Paolo, a collegiate church, two monasteries, two convents, and two collegiate establishments. The ruins of the walls which surrounded the city, and which were built of large polygonal stones without cement, are cited among the most striking remains of ancient fortifications in Italy. The vestiges of the ancient citadel are amongst the best specimens of the Pelasgic style of building, on account of the accuracy with which such enormous masses are fitted. It crowned the summit of the hill and was of an irregular oblong shape, about 2000 feet in circuit; the enclosed area was made an almost level platform, supported by walls of the most massive polygonal construction, varying in height with the declivity of the ground, and about fifty feet in height at the south-east angle. It has two square-headed gates, one on the north side being merely a postern communicating by a steep subterranean passage with the platform above, and one on the south side with a lintel 15 feet long by 5 feet 6 inches high. The cathedral above-mentioned stands in the centre of the platform. DODWELL, *Views, etc., of Cyclopean or Pelasgic Remains*, fol., London, 1833.

ALAVA or ALBA, (JUAN DE), died in 1537, was a native of Vitoria, and constructed, in 1498, the capilla-mayor of the cathedral at Plasencia in Estremadura, upon which Diego de Siloe, and Alonso de Covarrubias also were engaged. As maestro-mayor of that cathedral, he was one of that celebrated *junta* of the best architects in Spain which met to consider the state of the cathedral of Seville after the accident of 1511; and in 1512, was also one of that still more important *junta* which met at Salamanca to determine upon the projected site, design, and specification of works for the cathedral in that city. Their report is given at length by LLAGUNO, vol. i. p. 293. He was again one of another *junta* to report on the cathedral of Seville in 1513, and returned to Seville in 1515, to survey,

with Henrique de Egas, the cupola of the cathedral, and, together with him, to report on a design for the capilla-real, which the chapter proposed to build.

The name ALBA is a corruption of Alava, used by one author, and it is probable that another has committed the same error, when speaking of the builder, in 1516, of the capilla-mayor of the Convent of S. Augustin at Salamanca, which was erected in the *stilo gotico*. The contract for building within a year the three first chapels on the side of the town of the Cathedral at Salamanca was taken by him, 5th Nov. 1520. In 1524, the first stone was laid of the *gotico-Germanico* church of S. Esteban at Salamanca, of which he was *aparejador*; and in 1529, he wrote an "apology" or friendly criticism on the works of the cathedral at Segovia, by his friend Juan Gil de Hontanon, on whose death he succeeded as maestro-mayor there on 13th Sept. 1531, and the nature of the works he executed are recorded in the archives of the cathedral, c. 44. l. ii. 1. It is supposed that the noted bridge of Alvalat, near Plasencia, known to have been the work of a Dominican, was also executed from his design, and under his superintendence. 66.

ALAVOINE (JEAN ANTOINE), born in 1778, a pupil of Dumas, Faivre, and Thibault, assisted Jacques Célerier in the design for the fountain of the colossal Elephant proposed for the Place de la Bastille, at Paris, 1808; succeeded Célerier, 1810, in the direction of that work, which was abandoned in 1815; submitted seventeen designs for a monumental fountain on that site, which were successively adopted and laid aside by the government, and was finally commissioned, 1833, to erect the "Column of July" on the same spot. He died in 1834, and the column was completed in 1840, with considerable modifications, by the architect Duc, under whose superintendence it had been placed by Alavoine, who is also known as the designer of the Bains - Montesquieu and of the monument to Louis XIV, in the Place de la Victoire, at Paris; of the repairs and additions to the cathedral at Sees, and of the cast-iron spire of the cathedral at Rouen. A full description and history of the column, upon which the architects Lenoir and a son of Alavoine were engaged as superintendents, is given in the *REVUE GÉNÉRALE DE L'ARCHITECTURE*, etc. 1840.

ALBA, (the Roman ALBA POMPEIA). An episcopal city of the province of the same name, in the Sardinian States, contains a cathedral, dedicated to S. Lorenzo Martiro, three parish and as many other churches, four monasteries, three convents, and a college.

ALBA FUCENSIS or FUCENTIS, now represented by ALBA. The small village of Alba, about three miles north of the Lago Fucino, in the province of Abruzzo Ultra, in the kingdom of Naples, occupies the northern portion of the hill on which the ancient city was placed. The works of the latter present one of the most perfect specimens in Italy of ancient fortification: they are probably of different periods, the greater part being composed of massive irregular polygonal blocks, and the stone portion being constructed in a more regular polygonal masonry, serving as a facing to the rubble work of the rampart. There are also the traces of an amphitheatre, basilica, theatre, etc., and of several temples, one of which last, transformed into a modern church, preserves its ancient plan and columns. PRONCI, *Antichità di Alba Fucense*, 8vo., Roma, 1836. CLASSICAL MUSEUM, ii, p. 172.

ALBA LONGA. This once important city was situated on the east shore of the Lago di Albano, and on the ridge of the Monti Albani, near the convent of the Palazzuolo, in the States of the Church in Italy. No other ruins now remain but the fragments of the walls, which identify the site as discovered by GELL, *Top. of Rome*, 8vo. London, 1834.

ALBANO (the Latin ALBANUM). This city, consisting chiefly of one long street, with several palazzi and an old cathedral, dedicated to S. Senator or S. Pancrazio, is situated on the south side of the lake of the same name, celebrated for its EMISSARIUM, and now occupies part of the grounds of the

villas of Clodius and Pompey, which were included in that of Domitian. The ruins of the famous amphitheatre of the latter, a circular temple supposed to have been dedicated to Minerva, baths called Cella Magne, as if corrupted from Cella (C. Pompeii) Magni, and the camp of the Prætorian guards, are shewn to visitors; a great portion of the walls, and one of the gates of the last-named work, still exist; the walls were built of squared stones, many of them twelve feet in length. The tomb called the SEPTIZONIUM, and that at Palazzuolo, as well as the tomb of Aruns, the son of Porsenna (commonly called the monument of the Horatii and Curiatii), are also objects of curiosity; the latter, which is built of grouted rubble, cased with peperino stone, is fifty feet square and twenty-four feet high, with a circular central pedestal, twenty-seven feet high; and with a cone of ten feet in diameter at each of the corners. At some time in the last century, an urn with ashes was found in a small chamber in the circular centre portion. 28.

ALBAN'S (SAINT). A town in Hertfordshire, is situated close to the site of the ancient Verulamium. It takes its name from the British protomartyr Alban, put to death there under Diocletian, and to whose honour a monastery for one hundred Benedictine monks was founded there in 793. Ulsinus or Ulsiz, the sixth abbot, commenced the modern town, by building three churches and laying out the market-place (about 948). The road from each church ran to the abbey church, which, as it now exists, was built (1077-1088) of Roman brick from Verulam, and of flint, with but little or no stone work, by Abbot Paul, a monk from Caen, and a kinsman of Archbishop Lanfranc. The church appears to have been 440 ft. long in the clear, and to have been crossed at the distance of 124 ft. from the east end by a transept 176 ft. in extent: portions of the aisles and side-walls of the sanctuary, the transept, and lantern tower, three entire bays on each side of the choir, and six on the north side of the nave, are visible. It is supposed that not more than seven feet in height was built in a year; and it evidently was stuccoed externally and internally. Abbot John of Wheathamstede (1420-1440) altered the triforium for new windows, and added the large window at the west end. The alterations at the east end were subsequent, which renders that portion unusually interesting. BUCKLER, *A History of the Architecture of the Abbey Church of St. Alban's*, etc., 8vo, 1847, gives a good account of the successive changes in the edifice. The Lady chapel, now separated from the church by a public footway, and used as a school room; the three fine sepulchral chantries; the Norman flat wooden ceiling, not in good preservation; and the Galilee at the west end, are features of interest. Excepting the stately gateway of the abbey, now used as the entrance to the prisons, and three other churches (one, S. Michael's, an ante-Norman structure), the town possesses little attraction. W. H.

ALBANUS LACUS, see EMISSARIUM.

ALBANUS MONS. The culminating point of the Monti Albani, in the States of the Church in Italy, rises to a height of three thousand feet above the level of the sea: and was famous for the temple of Jupiter Latiaris, built by Tarquinius Superbus, of which the ruins were destroyed in 1783. The road to it, with the curbstones on each side, still remains, and is quoted as the most perfect specimen of the Roman VIA; it passes a remarkable monument cut in the face of the rock. 43.

ALBANY. The capital of the state of New York, in the United States of America, possesses a capitol, which is a stone edifice, containing the chambers of the Senate and House of Assembly; a state-house for public offices; the state-arsenal; about thirty places of public worship; male and female academies, of about 350 pupils in each; a poor-house; two orphan asylums; a theatre; medical college and hospital; a museum, public library, and college; and a prison. The houses are built of brick and stone: some yet remain, with gables to the street, recalling the Dutch origin of the city.

ALBARET (. . . d') is known only by his work, *Différens projets relatifs au Climat et à la manière la plus convenable de*

bâtir dans les Pays chauds, et plus particulièrement dans les Indes Occidentales, par M. d'ALBARET, architecte, à Paris, au nouvel Hôtel des Monnoies, 1776.

ALBARI (in late Latin, ALBINI). Whitewashers, as distinguished from TECTORES or plasterers. 19.

ALBARIUM OPUS (in late Latin, ALBUM OPUS). Several definitions of this term have been given, but the most satisfactory one seems to be that of Perrault and Gwilt, viz., that it was a species of TECTORIUM OPUS; and in accordance with the words of PLINY, *Hist. Nat.*, xxxv, 16, and xxxvi, 23, when compared with the use of the term by VITRUVIUS, iv, 3; v, 2, 10; vii, 2, 3, 4; it appears to have been applied to a setting coat of pure lime finished as white as possible, and not intended to receive colour. It is however nearly certain that in the fourth century, A.D., the words ALBARI and ALBINI meant little more than whitewashers.

ALBARRACIN (SANTA MARIA DE). A city in the province of Teruel in Spain, was once strongly fortified, and still possesses three gates; its fifteen streets are narrow and steep, on account of the site, and the two plazas are very small: all are paved, with a tile drain down the centre. The cathedral church of S. Salvador, presenting a mixture of the Moresque and Gothic styles, is not in good preservation; the nave is of the Composite order, with four chapels on each side, and the altar-mayor at its head; the chapel of N. Señora del Pilar would be admirable, if not so much loaded with ornament. There is nothing else worthy of attention in the city, except the *consistoriales*, under which are the confined and insecure public prisons; and the solidly-built hospital, erected in the last century. The houses are generally four stories high. w. h.

ALBARRAN (TOMAS MIGUEL) was *maestro-mayor* of the cathedral at Segovia in 1740, and built the lantern in place of the finial or spire of the tower, which had been thrown down by lightning. 66.

ALBEAR (JUAN DE) is buried in the cathedral at Astorga, with this inscription: "Jhoan de Albear, maestro de las obras de esta Sta. Iglesia, descendiente de la casa de Albear por linea recta de varon, natural de la merindad de Trasmiera, esta aqui sepultado, a 6 de Diciembre de 1592." 66.

ALBENGA. This maritime city is the capital of the province of the same name in the Sardinian states; its narrow streets are rendered picturesque by the large number of boldly-machicolated towers, with their forked battlements; three of these towers are much more lofty than the rest. The cathedral church of S. Michele has been modernized, but the octagonal baptistry (supported within by Corinthian columns, which are supposed to have been part of a temple to Minerva) still contains some early Christian mosaics. The city contains five monasteries, and one convent. 28.

ALBERGATI (IL BEATO NICCOLO). The changes made at the beginning of the eighteenth century in the design of M. A. Buonarroti for converting part of the baths of Diocletian into the Chiesa della Certosa, are partly attributed to an architect of this name by MILIZIA, who expressly gives him the credit of placing a chapel and altar where the magnificent gate of travertine stone had formerly been.

ALBERQUE. A term of Arabic origin, at first meant a tower or dove-cote: in Spanish it subsequently implied a den for wild beasts; and afterwards, as in French and Italian, an hostelry, a place of entertainment for man and horse. 66.

ALBERT (ARCHBISHOP) see YORK.

ALBERTI (ALBERTO) of Borgo S. Sepolcro, furnished in the time of Palladio one of those designs for the completion of the façade of the cathedral of S. Petronio at Bologna, which are preserved in that church. He died in 1589. NAGLER, *Lex.* 28.

ALBERTI (ARISTOTILE), a Bolognese, is called, in the catalogue of painters, Ridolfo Fioravanti; such is the statement with which MILIZIA commences his memoir, and as that writer is the only authority for the following details, they are given nearly in his own words. In Bologna, he removed the campanile with all the bells of Sta. Maria del Tempio, called by the

Bolognese La Magione, to the distance of thirty-five feet. At Cento, in the church of S. Biagio, he made the campanile stand upright, although it had inclined 5 ft. 6 in. from the perpendicular. In Hungary, he rebuilt a bridge over the Danube, and performed so many other wonders, that the king created him a knight, and caused medals to be struck in his honour. Ivan Basilides, the grand duke or czar of Muscovy or Russia, upon account of the reputation of this architect, sent for him, and commissioned him to build many churches.

ALBERTI (FRANCISCO), practised at Borgo S. Sepolcro, where he was born, and where several of his works exist. He died 1646. 68.

ALBERTI (GIUSEPPE), born at Cavalese in the Tyrol, in 1664, was sent to Padua to study medicine; but, having seen the architectural antiquities at Rome, he returned to the Tyrol in 1682, established himself at Trent, and built the chapel of the Sta. Croce in the cathedral of that city. He died about 1730. 26.

ALBERTI (LEONE BATTISTA). The son of Lorenzo Alberti, a noble Florentine, was born at Genoa, 18th February 1404. Precocious in his studies, he soon became famous, not only for his personal accomplishments, but for his productions in general literature, and for his ingenuity in mechanical contrivances. He became in 1447 a canon of the cathedral at Florence, being well versed in mathematics, jurisprudence, philosophy, and poetry, and in the fine arts to the extent of being a painter, sculptor, and one of the Masters in architecture. On all these subjects he wrote well; and his writings, printed as well as manuscript, are enumerated by TRICHET-DUFRESNE, in his memoir of Alberti appended to DA VINCI's *Trattato della Pittura*, fol. Paris, 1651; but the most interesting to the architect is the *Opus præstantissimum de Re Edificatoriâ*, fol. Florence, 1485, in ten books. He seems to have commenced his career as an architect at Rimini, having made, in 1447, for Sigismondo Malatesta, the model for the noble church, now the cathedral, of S. Francesco, finished in 1450; this building is described in *Tempio di Malatesta di Rimini*, fol. Fulgineo, 1794.

It was probably the reputation derived from this work which caused Alberti to be invited to Rome as the adviser of the pope, and of Bernardo Gamberelli (called Rosellino), in the works which that architect was carrying out for Nicholas V (1447-1455). But it is desirable to notice that VASARI, in his memoir of Gamberelli, does not recapitulate the works which he ascribes to this Rosellino in the life of Alberti, viz., the alterations of the papal palace, with other works in the church of Sta. Maria Maggiore, the restoration of the aqueduct of the Acqua Vergine, and the decoration of the fountain of Trevi; these two last matters are specially attributed by MILIZIA to Alberti, together with a design for covering the bridge of S. Angelo, and the commencement of a tribune at the head of the old basilica of the Vatican.

As it is difficult to affix correct dates, it is best to follow VASARI, who states that he was next engaged to adorn the principal façade of Sta. Maria Novella at Florence, finished in 1470 or 1477, which is otherwise ascribed to Bettini; the gate and Corinthian loggie are certainly by Alberti. The palazzo Rucellai about 1460, and a loggia opposite; the chapel for the same family in the church of S. Pancrazio, about 1467, now separated by the arch being walled up; and the choir (now much altered), the tribune, and the great altar (often stated to be designed by Da Vinci), of the church of the Annunciation, 1451, which had been built by Michelozzi in 1448; all in the same city, seem to have been executed before the year 1471. These works introduced him to Mantua, where he built the noble church of S. Sebastiano, the chapel of the Madonna Incoronata in the cathedral, and also made, 1472, for the duke Lodovico Gonzaga, the model for the church of S. Andrea, to which Juvara added the cupola. He also designed some few other works for that city; and on the road leading from Mantua to

Padua, there are certain churches which were erected after the manner of this architect, who has been fortunate enough to have the whole credit of the designs, although apparently they were often put into execution by other hands: thus, Antonio Manelli (VASARI), and Luca Fancelli (MILIZIA), superintended those of the Annunziata, and Silvestro Fancelli the others, at Florence; while those at Mantua were conducted by a certain Luca Fancelli or Fanelli, who may be supposed a near relation of the beforesaid Silvestro, although VASARI goes on to state the descendants of this last went by the name of the Luchi: Gian Francesco Mormando was also his pupil. Alberti died, and was buried, at Rome in 1472. He is supposed to have designed the palace at Urbino, for the duke Federigo Feltre, but it is not probable that he was engaged upon it. Among minor features, which assisted to create his fame, may be cited his placing arcades upon the architrave as an impost, so as to raise them and allow the whole curve of the arch to be seen: his book also will be remembered with gratitude, as the first in point of period, and perhaps in value, of modern times; indeed the labours of four centuries have not added to it so much as might have been expected.

ALBERTOLLI (GIOCONDO), the son of an architect of the same name, was born at Bedano, 24th July 1742. From the age of eleven years he studied with perseverance at Parma, and after he had attained his majority began to receive commissions, and in 1770 was engaged by the grand-duke of Tuscany, afterwards Leopold II, to design the alterations of a villa near Florence; on which he employed his brother Grato, and other pupils of the academy at Parma. This connexion enabled him to proceed to Rome and Naples, but he returned home in 1773, on account of family affairs; and in March 1774, Giuseppe Piermarini, the state architect, confided to Albertoli the interior decorations of the theatre of Milan, then in course of construction. Here his work was so satisfactory, that he was appointed professor of architecture in the Academy of Fine Arts, 1775, and engaged to embellish the imperial villa at Monza, erected by Piermarini in 1775-9. His books are, *Ornamenti Diversi*, 1782; *Alcune Decorazioni di Nobili Sale*, 1787; *Miscellanea per i Giovani Studiosi*, 1796; and *Corso Elementare di Ornamenti Architettonici*, 1805; all large folio works, and published at Milan. The title of Cavalier, usually prefixed to his name, was the result of accepting the order of the iron crown from Napoleon in 1809, on his resignation of the office of professor from apprehended blindness. He was extensively engaged in the design and execution of decorations, catafalques, and altars; among the latter, was the splendid one in the church of S. Marco at Milan: he is said also to have designed some of the ornaments of the Arco della Pace in that city. Among the best specimens of his skill, are the new façade of the Palazzo Melzi on the Corso di Porta Nuova at Milan; the villa of the same family at Bellaggio, on the lake of Como; the saloons in the palace of the Prince del Belgiojoso; and those of the Marchesi Cassendi, and Arconato, and of the Conte Antonio Greppi. He died 15th November 1839.

ALBERTOLLI (GIACOMO), nephew of Giocondo, was born in 1761 at Bedano, in the territory of Lugano. He resided at Venice until 1797, in which year he became professor of architecture, first at the seminary, and afterwards at the university of Padua, whence he went to Milan, where he succeeded Giuseppe Piermarini as teacher of architecture. He died of apoplexy, 6 June 1805. TIPALDO, *Biog. degli Italiani Illustri*.

ALBERTOLLI (FERDINANDO), H. and C.M.R.I.B.A., born towards the end of the eighteenth century, studied under his relation Giacomo, and afterwards at Rome. He erected a palazzo near the Porta Nuova at Milan, which has been considered one of the best recent buildings in that city, and also executed in various churches several altars of very graceful design. He published for the instruction of the students in the Academy of Fine Arts at Milan, of which he was the professor of ornament, *Porte di Città e Portezze, Depositi sepolcrali ed*

altri principali Fabbriche pubbliche e private di Michele Sanmichele Veronese, fol. Milan, 1815, and also *Fregi trovati negli Scavi del Foro Trajano, etc.*, fol. Milan, 1824 and 1838. He died in 1844.

T. L. D.

ALBERTONI (. . .). One of the four architects employed to execute the remarkable arcade leading from Bologna to the church of the Madonna di S. Luca, which was erected between the years 1676-1739, see illustration, ARCADE.

ALBI or ALBY (Latin, Albign, Alba Augusta). The capital of the department of Tarn in France, and the seat of an archbishopric. The streets are dirty, irregular, and narrow; the houses are all of brick; and the few places are not remarkable, excepting that of the new *Quartier Vignan*, which is large and fine. The avenues, terminating in this square, were formerly called the Lists of Alby, as being used for tournaments; and the promenade is still called *la Lice*. The cathedral of Ste. Cécile, built of brick, begun in 1282 and not completed until 1512, is thus described by BOURASSÉ, *Cathédrales de la France*, 8vo. Tours, 1843: the church generally in the style *ogival primitif*; a side entrance in the style *ogival secondaire*; and the jubé and the enceinte of the choir in the style *ogival tertiaire*. The south door, 1380, forms the principal entrance, as the tower, finished in 1475, standing at the western end, is too near the river Tarn to permit a western portal: the tower is two hundred and ninety feet high, square, with circular buttresses at the corners, and terminates in an octagon. The church is apsidal, more than 300 feet long, without aisles, transepts, or pillars in the interior; and the external walls rise in an almost unbroken face to the height of 120 feet. The nave is 88 feet wide between the external walls, and 98 feet high, its vaulting is considered in France to be a *chef d'œuvre* for its boldness, being more than fifty feet in span between the inner walls, from which it appears to spring; the spaces outside these inner walls, and which would otherwise be aisles, are occupied with chapels, each of which opens into the nave with a lofty arch. The windows, placed between broad but shallow buttresses, that are segments of circles in plan, have three lights each in the nave and two in the apse, and internally have the whole breadth of the chapels for their splay. The choir and sanctuary stand almost like a detached monument, surrounded by most elaborately rich stone screenwork, executed 1475-1512, with one hundred and twenty stalls, by itinerant masons from Strasburg. The roof and walls are still decorated with the frescoes and colouring which were given to them in the fifteenth and sixteenth centuries. A rough plan is given in the *ECCLÉSIOLOGIST*, vi, p. 98. The other principal buildings are the church of S. Salvi, the courthouses, the highly praised general hospital, the theatre, barracks, fountains, public library, museum of natural history, tribunal of commerce, communal college, archiepiscopal palace, and the prefecture, which is a castellated brick edifice, originally the abode of the Counts of Alby, and afterwards the residence of the bishop, when the diocese was suffragan to Bourges.

ALBINA (GIUSEPPE), called Soczus, or rather Sozzo, of Palermo, was also a sculptor and painter, a pupil of the architect Giuseppe Spatafora, and died 11th April, 1611. His life, without any account of his architectural works, is given by F. M. Baronius, in *GREVIUS, Thes. Ant.* xiii.

ALBINIANO DE RAJAS (P. PABLO), see RAJAS.

ALBIZTURIZ (ANTON) designed, in company with Luis de Gramondia, the noble parochial church of Cascanto in Navarre, about the year 1476.

66.

ALBOHAIRE (if from the Arabic article *al* and *boheira*, the diminutive of the Arabic *bahr*, water or lake, it is now corrupted by the Spaniards into *albufera*). An ornament formed with AZULEJOS in those arcades which have the shape of the old oven or lime-kiln, "figura de horno".

66.

ALBUM. The Latin adjective in the neuter gender for anything white, which even in classic times became a substantive. The album of the Latins is often to be seen on the external walls of the houses at Pompeii, exactly corresponding to

the description of *SUIDAS*, that is to say, as a portion of the wall whitened to receive the edicts of the praetor, or other advertisements and notices relating to the affairs of the citizens; and *MAZORS*, frontispiece to part III of *Les Ruines de Pompéi*, gives a portion of the external wall of the chalcidicum of Eumachia applied to this purpose, with examples of the style of the inscriptions. On a small scale it is often inclosed with a border, in the shape of the ancient tabellum or writing-tablet.

The opinion of some writers, that it was the room or place where such notices were exhibited, is undoubtedly erroneous. In the middle ages the word was used for a register or catalogue; and in modern times the term has been applied to a book appropriated to receive the contributions of those persons of whom it is worth while to collect memorials. Amongst the Scottish and German families especially, it was a custom, even till the year 1835, for travelling students to show on their return home such a book, to exhibit the acquaintances which they had formed while abroad. At present a traveller's notebook is called on the continent an album, but in this country it has become the title of a book containing drawings, prints, verses, and other miscellaneous fragments.

ALBUMEN. The substance designated by this name forms a constituent principle of organized bodies, and is found both in a solid and fluid state; the white of an egg may be considered as nearly pure fluid albumen: it is common to plants as well as animals, and the PRESERVATION OF TIMBER depends mainly upon the treatment of it. According to *SEGUIN*, it exists in a particularly large quantity in vegetables which ferment without yeast and afford a vinous liquor; this chemist was therefore led to infer that albumen is the true fermenting principle, and that its action in this way is powerful in proportion to its facility of solubility. Albumen is one of the few vegetable substances in which nitrogen is a component principle; and when exposed in a fluid form or moist to the atmospheric air, it runs rapidly to putrefaction; but if a thin layer of it be exposed to a current of air it dries, and is converted into a solid, hard, and transparent substance resembling horn, in which condition it may be preserved without change. It is coagulable by alcohol, by the stronger acids, and by heat; at 134° Fahr. white fibres begin to appear; at 160° the fluid is changed into a solid mass; and at 212° it dries, shrinks, and takes a horny appearance: it is insoluble in cold water after the process of coagulation; it is dissolved by alkaline solutions, and precipitated from them by acids. Bichloride of mercury (corrosive sublimate) and ferrocyanate of potash act upon it in the same manner as on animal albumen: the characteristics of the latter may be sought, *s. v.*, in *HOOPER, Lexicon Medicum*, 8vo., Lond., 1848.

ALBURNUM. The soft white substance called by timber merchants sapwood, which is the newly-formed unchanged wood lying immediately between the *liber* or inner bark and the wood. It is the principal channel through which the crude sap is conveyed from the roots into the leaves, and is therefore an essential part of all exogenous trees. As it consists of little besides vegetable tissue, it differs from the *HEARTWOOD* or *duramen*, which is the albumen under the condition of a comparatively solid secretion: and this is the reason of the heartwood being more durable than sapwood, and of white-wooded trees being generally unfit for other than merely temporary purposes. A new circle of alburnum is annually formed round the old, so that a transverse section of the trunk presents a tolerably correct register of a tree's age, each zone marking one year: at least this is a statement which has received the sanction of very high authorities, although impugned by others because some specimens of mahogany would require a belief that the trees had existed three or four thousand years. The alburnum is found in largest quantities in trees that are vigorous, and in an oak of six inches in diameter it is nearly equal in bulk to the hard wood.

ALCALA DE GUADAIIRA, or DE LOS PANEDEROS
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(anciently *HIEINIPA*). A town in Andalusia, containing, besides four *plazas*, two parish churches, municipal offices, two general hospitals, a lying-in hospital, a house of refuge, three seminary schools, a prison, an abattoir, a stone bridge of seven arches, and the remains of a fine Moorish castle and mosque. In the vicinity are numerous tunnels, some being six miles in length, into which is gathered the water which flows to Seville, at first in a brick cañeria, afterwards carried in an open channel on four hundred arches of twelve feet span, called the *Caños de Carmona*. 50.

ALCALA DE HENARES, or DE S. JUSTO (the ancient *COMPLUTUM*). A city of the province of New Castile, in Spain, contains a bridge and many other remains dating from the end of the fourteenth century, and also the magnificent Gothic cathedral of SS. Justo y Pastor, called *el Magistral*, consisting of a nave and two aisles, designed by Pedro de Gumiel, and built 1497-1509; with three parish churches, a theatre, four hospitals, barracks, and riding-school, three *plazas*, in one of which is the town-hall, and two *alamedas*. The university formerly possessed twenty-four colleges and ten thousand students. The largest edifice is the *collegio-mayor* de S. Ildefonso, by Gumiel, consisting of buildings round three squares, and a magnificent chapel; the first stone was laid 14th March, 1498: it was continued by Rodrigo Gil de Hontanon, 1541-1553, with a new façade, but it has never been completed. The principal cloister was designed and executed by Josef de Sopena, who died in 1676; it has two stories of the Doric, and one of the Ionic order, with 48 columns in each. The city also contains the beautiful elliptic church, and the monastery of the Bernardine monks, having three hundred and sixty-six apartments under the chief floor, and the handsome palace of the Archbishop of Toledo; the first stone of the latter was laid in 1617, and it is disputed whether Juan Gomez de Mora or Juan Bautista Monegro was the architect: *LLAGUNO* gives an opinion in favour of Monegro, but on grounds which appear to be too slight. There is no doubt however that the former architect was engaged on the college del Rey, which has a handsome façade and a cloister with columns. In 1602 Gaspar Ordoñez began the new church of the Jesuits, and directed the work till 1608; when Agustin or Valentin Ballasteros continued it. It is doubtful whether the designs were given by Ordoñez or by Francisco de Mora, to whom also some portions of the college of the Jesuits, and its Corinthian façade, in two stories, finished in 1625, are ascribed by some authors; although *LLAGUNO* gives the credit of this front to the nephew, Juan Gomez de Mora. In 1773 the restorations of the monastery of the barefooted Carmelites were designed by Don Ventura Rodriguez. The new cavalry training schools, etc., occupy nine of the eighteen monasteries.

ALCALDE (CRISTOBAL DEL), is mentioned as architect of the Sala de la Medianaranja of the Alcazar at Segovia, in an inscription of the year 1456. 66.

ALCANDRI (...). Designed and erected the noble building, said to be the largest known for the national game of *pallone*, at Macerata, in the Papal States. 28.

ALCANIZ. A city in Aragon, situate on the right bank of the river Guadaloupe, which is here crossed by a substantial stone bridge of seven arches. It comprises nine squares, and many well-paved spacious streets lined with well-constructed edifices, several of which have considerable architectural merit: the principal buildings are a magnificent *churriguesque* collegiate church, consisting of a nave and two aisles, built by Miguel Aguas, 1736-9, three parish churches, a town-hall, a large mediæval guildhall, ecclesiastical court-house, police-office, five schools, hospital, well-ventilated prison, cavalry barracks, storehouse, theatre, and several convents, one of which is used for infantry barracks. The *alameda* is a mile long, and is ornamented with a good fountain.

ALCANTARA, a Spanish term meaning bridge, which is formed of two Arabic words, *el cantera*, applied as the bridge

emphatically. **ALCANTARILLA** is a diminutive of the above term, signifying a small bridge, and in some parts is applied to a subterranean conduit. 66.

ALCANTARA (the Roman *NORBA CÆSAREA*). A fortified town of Estramadura, in Spain, less worthy of notice for the *plazas* and five gates, the two parish churches (one of which is a large Gothic pile), the town-hall, schools, custom-house, hospital, barrack, prison, convents, and hereditary mansions of three noblemen, than for the noble convent of the order of Calatrava, built of granite. Its church, begun in 1506, and continued in 1514 by Pedro de Larrea, has a nave of forty feet, and two aisles of twenty feet in height, in which is the partly Gothic, partly Italian chapel called *Piedrabuena*, erected by Pedro de Ibarra in 1550. The other great feature of this town is the bridge erected for Trajan by Caius Julius Lacer in 105; it consists of six granite arches of pulvinated work set without cement, is 600 feet long, 28 feet wide, and 245 feet above the usual level of the river Tagus, which being much enclosed by the rocks is here subject to great floods, and sometimes rises 136 feet.

ALCANTARA. A fertile valley between Bellas and Lisbon, receiving its name from a stupendous aqueduct, one of the most magnificent works of modern times. It is 56,380 feet long, and supplies the capital with water. It crosses the valley on thirty-five arches, of which the central one is 249 ft. high according to Bowles; 212 ft., Bell; 220 ft., Rennie: the span 150 ft., Bowles; 104 ft. 9 ins., Bell; or 108 ft. 2 ins., Rennie. Fourteen arches are elliptic, the rest semicircular. A noble pathway, bordered by a parapet of solid blocks of stone, leads across the summit; the water flowing under an arched stone roof, in a stream 13 ins. wide by 7 ins. deep, for which there are two channels, one only being used at a time. Light and air are admitted at intervals into the vaulting by windows and towers, which are furnished with close iron gratings. The breadth above the buttresses is 23 ft. 3 ins.; the width of the section at the top is 30 ft. 1 in., at the bottom 25 ft. 10 ins. The water is clear, but holds carbonate of lime in solution. The foundation-stone was laid in the year 1713, under the auspices of John V, by a Roman or Neapolitan, named Antonio Canavaro or Cannevari, who was succeeded by Brigadier Manoel de Moya, who finished it Aug. 6, 1732. (See *detached essay, AQUEDUCT.*)

ALCANTARA (DIEGO DE), was employed in 1572 as superintendent of the works at the **ALCAZAR** of Toledo, when he was engaged by Juan de Herrera to assist him at Madrid in preparing designs for the church at the Escorial and for some others. In the following year he returned to the alcazar, whence he went in 1575 to inspect the works at Aranjuez. He was again summoned by Herrera to assist in erecting the pillars of the church of the Escorial, and was rewarded in 1577 with the title of *APAREJADOR* of the above-named alcazar, with the regular salary, which after further services was raised in 1581. In 1582 (Feb. 25) he became *maestro-mayor* of the cathedral at Toledo, and in 1583, of the convent of S. Jago at Uclés. Although there is no record of any works designed by him, it is sufficient praise to say that he was highly esteemed as sculptor to the cathedral of Toledo from the year 1573, and that Herrera in his will named him, with Francesco de Mora, to the king, as being able to do better service, and more trustworthy in matters of architecture, than any other persons. He died 11th April, 1587, being still a young man. 66.

ALCATIFA. A Spanish expression derived from the Arabs, for the nucleus, basis, or layer of rubbish put upon the soil before a brick or stone pavement is laid. It also signifies the pavement, when of mean materials. It is really the **ALFOMBRA** broken up into dry rubbish. 66.

ALCAYCERIA, a street or district of shops; as in Seville there is one for silk, and one for crockery. The word is a Spanish use of an Arabic term for a square or court in the royal residences, in which the stalls of goldsmiths, and some other trades, were permitted. 66.

ALCAZAR. A word made up by the Spaniards from the Arabic *al casr*, which means emphatically "the house", i.e., the residence of the sovereign, and was used to signify the dwellings of the reigning Moors in Spain. The two most remarkable specimens are the alcazars of Seville and Segovia; for although the Alhambra is the finest example, and is essentially an alcazar, yet the last title has merged in the name **ALHAMBRA**. The alcazar of Seville was built in the tenth and eleventh centuries, by Jalubi, a Toledan architect, for Prince Abdurrahman. The present building, however, is the result of various alterations and additions, principally by Don Pedro about 1364, by Ferdinand and Isabella, Charles V, and others, down to the nineteenth century: it is now considered "restored", having been painted throughout, more fancifully than correctly. The general frontage strongly resembles some of the old Venetian palaces of the Byzantine style; and altogether, although much deteriorated by modern changes and supposed improvements, it is a fine specimen of a royal palace. The alcazar of Segovia is situated on the ridge of an abrupt rock, just outside the town; but however picturesque its parapets and numerous high-roof turrets render it, little of the old Moorish work remains, yet enough, however, to give a good idea of its former splendour. It is now a military college. To the above-named instances may be added the alcazar near Malaga, built between the years 1333 and 1343 by the monarch Youssouf-aboul-Hadjadji, from his own plans and under his own directions: and that which is mentioned by GIRAUD DE PRANGÉY, *Architecture des Arabes*, 8vo. Paris, 1841, as having been built in 936 by the architect Abdallah ben Younas, otherwise called Muslimatou ben Abdallah, for Abderrahman III, at Zahra, a town of which even the ruins have disappeared: the destruction of the palace, said to have contained 4,312 columns, was commenced in the year 1003. J. B. W.

ALCHA. The late Latin word for a cellar, pantry, or an apartment for the reception of drinking vessels, etc. **CARPENTIER, Glos. Nor.**

ALCOBAÇA. A small market town in Estramadura, with five churches, one of which belongs to its magnificent Carthusian monastery, founded in 1118. It is considered the richest in Portugal, and inhabited by 300 persons. The west front of the monastery, including the church which forms the centre, extends 620 feet; the depth is about 750 feet. The church is about 300 feet long, and has been the general place of sepulture for the kings of Portugal. The kitchen is nearly 100 feet long and 63 feet high, and the fireplace is 28 feet long and 11 feet broad, which is placed in the centre of the floor; the chimney forms a pyramid, resting on eight pillars of cast iron. The refectory is 92 feet long by 68 feet wide, and is divided in its breadth by two ranges of columns. The hospitium forms the north-west wing, and extends 230 feet, being divided into stately and convenient apartments. **MURPHY, Travels in Portugal**, 4to. London, 1795.

ALCOCK (JOHN), born at Beverley, in Yorkshire, took his degree of LL.D. at Cambridge in 1461, and, after a career of almost uninterrupted success, became bishop successively of Rochester (1471), Worcester (1477), and Ely (1486), and lord chancellor. He died about 1st October 1500, and was buried in the chapel which he had built (1488), at the east end of the north aisle of the choir of Ely cathedral. He added something to every one of his episcopal houses: that at Ely is particularly noted for his "hall with the gallery"; enlarged the church, rebuilding the north side, at Westbury; repaired that of S. Mary, at Malvern; and built S. Mary's or the University Church, Cambridge; and a chantry on the south side of Trinity Church at Hull. He was appointed, conjointly with Sir Reginald Bray, surveyor of the royal works and buildings in the reign of Henry VII. Together they built the collegiate church of St. Giles at Malvern.—**ROB. STEWARDE, Continuation of Hist. of Ely**, in **WHARTON, Anglia Sacra**, fol. Lond. 1691; **ABINGTON, Antiq. of the Cathedral Church of Worcester**, 8vo. Lond. 1723.

ALCOHOL. The well-known intoxicating liquor procured by distillation from various vegetable juices and infusions of a saccharine nature, which have undergone the vinous fermentation. It is called proof spirit when it contains about one-half its weight of water; and the most skilful distillers cannot expect to obtain a liquid which shall contain much more than 90 per cent. of pure alcohol: therefore, when required as a solvent for resins, oils, gums, etc., in order to form varnishes, it must be concentrated. One reason for the faults of many varnishes will be seen to arise from unconcentrated alcohol; another is to be found in the matters abstracted by the spirit from the means used in the concentration; and another in the peculiar volatile fatty matter which after moist autumns, when damaged grain abounds, is contained in the alcohol distilled from its fermented wash. *URE, Dict. of Arts, etc., 8vo. London, 1838.*

ALKORAN or ALKORAN. For a very long period these words have been applied to the tall towers attached to the Mahometan mosques in Persia, which are now generally called minarets. The original authority for the employment of the word in the above sense appears to have been *WICQUEFORT, L'Ambassade de D. Garcias de Silva Figueroa en Perse, 4to. Paris, 1667, fol. 17.*

ALCOVE (It. *alcova*; Ger. *alkoven*). A word derived through the Spanish term *alcoba*, from the Arabic article and noun which signifies a cave, hollow, or recess (whence possibly the English word "cove", expressing a curved surface). The word has been used as a synonym for *BAY*, because it has always been associated with the idea of a recess; it is properly an edifice, or a part of an edifice, with a curved roof, such as the alcoves existing in the alcazar at Seville, where they are vaulted. Considering it in this manner, it will seem to correspond to the *зотнеца* of the ancients. Although a garden seat open on one side, and built under the necessary conditions, has always properly received this name, yet the popular impression that it was intended for repose, may have guided the application of the term "alcove": for the idea of a recess has long been amplified by the notion that it must be intended for a bed or couch. In this sense, the original Spanish system of elevating the floor and lowering the ceiling, in reference to the chamber of which it forms a part, has been preserved in the state bed-chambers of France and Italy; in apartments of less pretension, and even in some palaces, it has appeared sufficient to place the bed upon a dais, and in many cases to enclose it by a balustrade or other screen: such, according to the best evidence to be obtained, was also a custom among the Romans. If the alcove is intended to be a bed-chamber, then warm and cold baths, dressing-rooms, and water-closets, according to the magnificence of the mansion, and the rank and opulence of the owner, should be placed at the sides of the alcove. Many excellent arrangements of plan for this purpose exist in the palaces of Spain, Italy, and France: the recess should, as a matter of course, correspond in style and decoration with the apartment to which it belongs; but the difficulty of properly ventilating it is a great objection to its use.

ALCOY. A large town of Valencia in Spain, inclosed by clay walls, and entered by numerous gates; four stone bridges serve for the communication betwixt the different *quartiers*. The streets are regular, well paved, and some of them provided with drains: they contain many modern buildings, a feature rare in Spanish towns; and a Roman bridge adds to the interest of the place. The public edifices are a large parish church, of classic architecture, built in 1740, and three smaller churches, the schools, a town hall and consistory, an asylum for the poor, a public granary, and a prison, which was formerly a convent.

ALDBOROUGH. A market town in the West Riding of Yorkshire, is supposed to be the capital of the Brigantes, and the *Isurium* of the Romans. Among other antiquities, the remains of aqueducts, and some beautiful tessellated pavements, have been discovered.

ARCH. PUB. SOC.

ALDEHÜELA, or ALDEGÜELA (DON JOSEF MARTIN DE), one of the most successful architects of his time, was born at Manzaneda, near Teruel in Valencia, in the year 1730. He was first a pupil of D. Josef Corbinos, and afterwards improved himself under D. Francisco de Moyo, in the kingdom of Arragon. Soon after he had passed his examination for a master of works (*maestro de obras*), the church and college of the Jesuits at Teruel were entrusted to his care and direction. He finished them to general approbation, and thus gained the patronage of the Bishop of Cuenca, who commissioned him to finish the church of S. Filipe Neri in that city. In the execution of this work he increased his reputation, enlarged his practice, and was named *maestro-mayor* of the diocese. At Cuenca, he also built the church of the nuns of S. Pedro; designed the secretary's, auditor's, paving (*enlosado*), and other offices in the cathedral; the church and convent of S. Antonio Abad; the church of the Franciscan nuns of the Conception; the almshouse; and a monastery of barefooted Franciscan friars. The Bishop of Malaga employed him to construct an aqueduct to bring water to that city, from a source about six miles distant, by means of thirty bridges of different sizes, four tunnels, and various culverts. He also directed the works for the college of S. Telmo, which he arranged in the building which had before been that of the Jesuits; and for the tribunal of commerce with its offices; and he reconstructed the church of the Augustines, with a great *retablo* of jasper and stucco; and designed other altars within and without that city. The Council of Castile obtained his services at Ronda, for the completion of the great bridge (100 varas, say) 300 feet high, over the Tajo; the water supply, and other public works, in that city; and the bridge over the Genil at Loja; and commissioned him in 1793 to proceed to Granada with the engineer D. Domingo Belestá, and with his pupil D. Silvestro Bouilla, to make plans of the famous palace of Charles V in the Alhambra, and to arrange it for a college of 200 nobly-born youths, who it was expected would be sent for education from America. He died in the year 1808, aged 78, with great reputation for the clearness and facility with which he arranged and executed works of the highest importance. 66.

ALDER. The English name of *ALNUS*. It is also applied to *CUNONIA capensis*, *WEINMANNIA trifoliata*, and *ELECTRONIA*, woods of the Cape of Good Hope. 71.

ALDHUN, ALDUNE, or ALFUN (BISHOP), see *DURHAM*. **ALDRED (BISHOP),** see *WORCESTER*.

ALDRICH (HENRY). Born at Westminster in 1647, was dean of Christ Church College at Oxford. He designed the façades, with an Ionic order, for the east, north, and west sides of the celebrated square, called the Peckwater-quadrangle, in that college; the parish church of All Saints, 72 feet long, 42 feet wide, and 40 feet high; and it is stated by *WARTON, Life of Dr. Bathurst*, pp. 68-70, that he gave the design (which was executed with alterations by Sir Christopher Wren) for the chapel of Trinity College, in that city. He died on the 14th December 1710. His *Elementa Architecturæ Civilis*, was published in 8vo., 1750; a second edition with a translation appeared in 4to. 1789; and a third impression in 8vo. Oxford, 1818.

ALDUNE, ALDHUN, or ALFUN (BISHOP), see *DURHAM*.

ALACERIA. A late Latin word for a palace, castle, or other large edifice. 19.

ALAEATORIUM. An apartment in imperial Roman residences, which was attached to the *thermæ*, and appropriated to the use of persons playing with ale or dice. *BATISSIER, Descr. de l'Art Monumental*, 8vo., Paris, 1843, p. 279.

ALEHOUSE. A house licensed to sell beer and cyder only; it must be rated at £8, £11, or £15, according to the population, etc., of the town. A good treatise upon its requirements will be found in *LOUDON, Ency. of Cottage, etc., Architecture*, 8vo. Lond., 1838 and 1846. T. T.

ALEKSANDROV. A small town in the government of Vladimir in Russia, interesting to the architect for the extent

and character of the buildings for the government *haras* or breeding stud, commenced in 1761 and finished in 1781. 50.

ALENÇON (anciently ALENCONIUM), formerly the capital of the duchy of the same name, and now of the department of the Orne, in France, is a city with broad, well-paved, and clean streets, and four gates. In the place Buonaparte, or Bourbon (the present appellation is uncertain), which is about three hundred and eighty-seven feet in diameter, the traveller finds grouped the remains of the castle of the Montgomeries, 1000-1219, destroyed by Henri IV in 1592; the fine tower called *la couronnée*, 150 feet high, which defended the drawbridge; the grand gateway of the castle flanked by two towers, built 1404-1415, which lately served for the prefect's residence; the hôtel-de-ville, of which the first stone was laid 29th September 1783; and the palais-de-justice, commenced in 1821, from the designs of La Rue. The cathedral is dedicated to the Virgin Mary, and consists of a nave dating from the fourteenth century, which is 101 feet 6 inches long, 29 feet 6 inches wide, and 32 feet 9 inches high, with aisles 14 feet 6 inches wide and 25 feet 6 inches high. The coloured glass, 1367-1404, escaped damage during the Revolution, and was perfect in 1805, but was much injured by a storm in 1821. The choir is a modern building, and much plainer; it is about 55 feet 6 inches long, and of the same width as the nave; the altar is in the usual Italian style of four columns and a showy baldacchino. The pulpit is handsome. Two churches were restored between 1801 and 1805 from the ruin into which they had fallen during the Revolution. The fine church of the college formerly belonging to the Jesuits, was 85 feet long by 23 feet wide, is now divided in its height to form a college with an observatory, and a public library, furnished with curious bookcases from the Val Dieu. The city also contains the prefect's offices, built 1671-1676; the *Bicêtre*, or dépôt de mendicité, which is now a house of detention and correction, built on a regular plan in 1781; two large hospitals, a fine cornmarket, a lunatic asylum, a museum of natural history, and a theatre commenced in 1805. *Histoire d'Alençon*, Svo. 1805, by GAUTIER, with *Supplement*, 1821. 74.

ALEOIS. A late Latin word for loopholes in castle walls, through which arrows can be discharged. ARABESTINÆ. 19.

ALEOTTI (GIAMBATTISTA), the son of Vincenzo Aleotti of Ferrara, was born in 1546 at Argenta in that territory, and apprenticed to a builder, but became a civil and military engineer and architect in the service of Alfonso II of Ferrara (1571-1597). After the death of that prince he was employed by Pope Clement VIII to build the citadel of Ferrara. Several theatres and other public buildings from his designs exist at Mantua, Modena, and Venice; and he was employed by Ranuccio I of Parma, for whom he executed in 1618 his most celebrated architectural work, viz., the great theatre in that city, which was completed in about a year: it is described by DONATI, *Gran Teatro Farnesina di Parma*, 1817. He wrote several tracts on hydraulic engineering. He died 1636. FRIZZI, *Storia di Bologna*, given in TIRABOSCHI. 26.

ALERIA, in the island of Corsica. This episcopal city was the ALERIA of the Romans, and a few antiquities are still at times discovered. The cathedral, dedicated to S. Marcellus, being in ruins, the parish church of S. Erasmus is used for the visitations of the bishop.

ALEPPO, or HALEB-ES-SHABHA (formerly CHALYBON and BEREA). A city in northern Syria, comprising a circuit of seven miles, surrounded by walls 30 feet high and 20 feet thick, in which are nine gates. The streets are gloomy, being covered and lighted only by gratings, but generally well paved, and the houses are of two and even three stories in height, built of the white gritty stone of the vicinity, which is at first easily cut, but becomes indurated by exposure to the air; many houses have spacious apartments, large windows, and richly ornamented walls and ceilings; the latter often being highly painted and gilt. The roofs are covered with gardens of luxuriant vegetation. The ancient scullery or palace of the pasha was destroyed in

1819-20; the ruins attest its former magnificence, especially a gateway of admirable workmanship, with an arch formed of blocks of black and white polished marble. The former extent of the city may be imagined from the account given by the French consul Rousseau; who reckoned five serais; one hundred mosques, that of Zecharia being the most celebrated; fifty mesjeds or oratories, that called Helawie being the most beautiful, and supposed by Pococke to have been a Christian church built by Helena, the mother of Constantine; ten or twelve public schools; two libraries; five courts of justice; sixty baths; more than forty great bazaars; thirty-one khans; two hundred fountains; sixteen religious institutions; five Christian churches; and forty thousand houses: the present city contains little more than a third of these buildings, the rest having been destroyed by the earthquake of 13th August 1822. The external appearance of the town, with its roofs ranged in terraces, and a crowd of cupolas and minarets of dazzling whiteness, is still, however, very striking. The two libraries still exist, one attached to the Ommanieh mosque, the other to a college called the Ahmedieh. The most important building is the Djama el Adelieh, which is reckoned to be the most elegant mosque in Syria; it is surmounted by a magnificent dome, and adorned with a tall and elegant minaret. The beautiful portico of the mosque was injured by the earthquake above mentioned. An aqueduct, partly level with, and partly under, the ground, is said to be coeval with the city.

ALESSANDRIA DELLA PAGLIA, or ALEXANDRIA, so called in honour of Pope Alexander III, is the chief city of the province of the same name in the Sardinian States. It contains a highly ornamented duomo or cathedral church, dedicated to S. Pietro Apostolo; twelve churches, the principal of which are those of S. Alessandro, S. Lorenzo, and Sta. Maria di Casa Grande, or di Loreto, which is modern; twelve monasteries, five convents, a royal college and a theological seminary, a gymnasium, an orphan asylum, three hospitals, the Palazzo Pubblico, fine barracks, a handsome modern theatre, and some good palazzi, including that of the Ghilini family, built by Alfieri. The citadel, built in 1728, is as large as many towns, with a piazza and parish church in the centre of it.

ALESSANDRO (BORTOLO D'), called Manopola, a Venetian architect, is stated in the *ABECEDARIO PITTORICO* to have invented the system of supporting a building while the foundations are being taken out and replaced. He made use of this invention in the year 1602, keeping the ducal palace suspended in the air while more than seventy of the large columns in the cortile, on which the arches rest, were replaced. 30.

ALESSANO, the Latin ALEXANUM. The seat of a bishop in the province of Otranto, in the kingdom of Naples, is built on the ruins of the ancient LEUCA, and contains a cathedral called "of the Transfiguration". 75.

ALESSI or ALESSIO (GALEAZZO), called Perugino, born at Perugia about the year 1500, was a pupil of Giambattista Caporali, and then chamberlain to the cardinal of Rimini. After studying the architectural antiquities of Rome, he began his career of practice in his native city by directing the works of the monastery of S. Pietro, and by completing for the cardinal (1544) the buildings which had been commenced by Sangallo in the fortress called the Citadella Paolina: the entrance-gateway of the fortress and the governor's residence are by Alessi, who also built the chapel del Sacramento in the cathedral of S. Lorenzo and the front of the church of Sta. Maria del Popolo in the same city, besides several palazzi. After the execution of many works for the above-named prelate, the reputation which he had obtained, especially for those in the Citadella Paolina, caused him to receive, about the year 1552, an invitation to Genoa, where his first work was the reconstruction, fortification, and decoration of the arsenal, which he extended into the sea for a considerable distance, adding a semicircular haven ornamented with rusticated columns and niches, while at the extremities of the half circle he placed two

bastions for defence: on the piazza above and behind the arsenal, on the side towards the city, he built a colonnade of the Doric order, leaving a spacious square for the accommodation of the guards in the centre; and above this building, he provided a platform for the artillery, of the same size, but also extending over the two bastions and the gate, so as to defend the arsenal from all attacks either from the land or sea-side. Alessi also constructed the new mole, which is about five hundred yards in length, erected the lighthouse thereon, and built the gate of the old mole, containing a guardhouse, and decorated it towards the city with a straight front, composed of three arches between four Doric pilasters, the front towards the sea being semicircular, ornamented with rusticated Doric columns and niches. He restored the city wall towards the sea, and also executed the public granaries (G. ARCARDO); the loggia dei Banchi or Banchieri, or old exchange, which is one very large hall about 110 feet long by 60 feet broad, the sides being supported by sixteen arches and columns; the Palazzo Reale; the repairs and embellishment of the duomo of S. Lorenzo, for which he built the cupola, and designed and erected the tribune, choir, and side chapels; and he executed the church of Sta. Maria di Carignano, a building often supposed to be the cathedral church. In addition to these works, the city owes the greater part of its architectural reputation to Alessi; for even at present Genova la superba can boast of little more than the two fine streets, the *nuova* and the *nuovissima*. The first of these was formed by him through a mass of obnoxious buildings, and consists of thirteen palazzi, which have changed their names so often that it is extremely difficult to identify them with the works mentioned by MILIZIA and others: the result of an investigation of the best authorities gives him the reputation of having designed the palazzi Centurione now Doria minore, Imperiale Lercaro, Saole or Brignole Saole now called Brignole del Rosso, Selvago afterwards Spinola and afterwards Serra now called del Sole, attributed to Tagliafico by some writers, and Spinola Arcuata; besides these the palazzi Adorno and Palavicini are mentioned by MILIZIA, but these names are not now known; they may be merged in those of the palazzi Raggio and Spinola, of which the architects are not remembered; or may be found among the palazzi Cambiaso, Carrega, Giustiniani, and Grimaldi, which are attributed to Alessi by GAUTHIER, *Les plus beaux édifices de la ville de Gênes*, etc., fol., Paris, 1830; and indeed, by tradition, the Doria palace by Lurago, and that of the Balbi by Bianco, were the only ones in this street not designed by Alessi. Other works by his hand are the palazzo Brignole minore, in the Strada nuovissima; the two palazzi Lomellini, near the public baths; the palazzo Durazzo, now much altered; that of the Palavicini, near S. Bartolomeo; another for Pietro Francesco Grimaldi, near the church of S. Luca; and one for the Grimaldi family, afterwards possessed by the Saoli, near the Porta Romana, in the Borgo di S. Vincenzo. Alessi also designed and laid out several streets leading from the old city, and among them that from the Ponte Decimo, commencing the road into Lombardy. Among his designs executed in the Borgo di S. Pier d'Arena, were the much admired grotto, now ruined, in the gardens of the Doria Panfilii palace, and the palazzi Giustiniani, Doria, Grimaldi della Rocca, Saole, Spinola, with that of the Imperiale Lercaro and its opposite villa, and many more. VASARI and SOPRANI mention with special praise the fountain for the Capitano Lercaro at Fiascolo, outside the Porta S. Tommaso; the lake for Adamo Centurione at Peglia, seven miles from Genoa; both places afterwards came into the possession of the Doria family; and the curious baths, now destroyed, which were constructed, one for the Grimaldo della Rocca palace abovenamed, and the other for Giovanni Battista Grimaldi, in the palace at Bisagno; Alessi also erected the villa Palavicini, outside the Porta dell'Acquasola; the villa d'Agnolo, on the banks of the river Polcevera; and in 1557 (it is said from the designs of M. A. Buonarroti) the villa Giustiniani, now Cambiaso, at Albaro; and besides these works, he left behind him

drawings and models of designs, which were subsequently executed both within and without the city. At Bologna Alessi executed in 1570 the entrance and chapel of the Palazzo Pubblico, finished the Palazzo Cellesi, now the Palace of the Institute, according to the plan of Pellegrino Tibaldi, and made designs for the front of the cathedral church of S. Petronio; he afterwards visited Ferrara, and thence went to Milan, where he erected the palazzo of Tommaso Marini, duca di Torrenuova, now converted into public offices; rebuilt (1576) the church of S. Vittore al Corpo, to which he intended to add a magnificent cortile; the Uditorio del Cambio; and the front of the church of Sta. Maria presso S. Celso, built from the plans of Bramante: he then visited Turin; was engaged in modernising the cathedral church at Assisi, and, with Giulio Dante, in building from the design of Vignola the church of the Madonna degli Angeli, outside Perugia. During this time he was constantly making designs for buildings in France, Portugal (where the title of cavaliere was conferred upon him), Naples, Sicily, Flanders, and Spain, which last country he visited in person, according to PASCOLI and SOPRANI; although it must be observed that LLAGUNO does not chronicle the result. On his return to Perugia he was received with great warmth, was admitted into the noble Collegio di Mercanzia, and was sent to negotiate with Pope Paul V. It was at this time that he made a design for the church del Gesù at Rome, and for the Escorial in Spain. The palazzo for the Cardinal della Corgna, and another for the duke of the same name, at Castiglione, on the lake of Perugia, were amongst his latest works. He was engaged upon a commentary on Vitruvius when, according to PASCOLI and SOPRANI, he was requested to revisit Spain to superintend the works of the Escorial, but he declined on account of his age and infirmities. He died 31st December 1572, and was buried in his family tomb in the church of S. Fiorenzo, at Perugia. There is no monument or inscription to his memory.

ALESSIO (the Greek AKROLISSUS; the Latin LISSUS). The seat of a bishop in Albania, is chiefly famous for the ruins of the ancient cities, and for the mosque in which Scander Beg, one of the heroes of the fifteenth century, is buried.

ALET, or ALETH (in Latin ALECTA, ELECTA or ELECTUM). A small city, in the department of the Aude in France, to which the episcopal see was transferred from Limoux in 1318. TAYLOR and NODDER, *Voyage Pittoresque* (Languedoc ii) fol. Paris, 1837, give views of the abbey in ruins, of the exterior of the church, of the interior of its apse, and of two capitals. The church was consecrated in 873, but was almost reconstructed in 1018. It had a nave and two aisles, a five-sided apse, two slightly projecting transepts, and in the middle of the nave two lateral towers. The exterior decoration of the apse and south porch almost justify the statement of some French antiquaries that they are details from a temple to Diana, for the work, which is of the end of the eleventh century, is the finest specimen in France, except perhaps the baptistery at Poitiers, of the Romanesque imitation of the antique.

ALEXANDER (C. LICINIUS), see LICINIUS ALEXANDER.

ALEXANDER OF NORMANDY (BISHOP), see LINCOLN.

ALEXANDER (OF CRICHTON), see CRICHTON.

ALEXANDER (DANIEL ASHER), born in London in 1768, was educated at S. Paul's School, and, 11th Oct. 1782, was admitted a student of the Royal Academy, where, two months afterward, he obtained a silver medal. He was a pupil of Samuel Robinson, and as soon as he was out of his articles he erected a residence for Dr. Saunders at Highbury Hill; Scott's warehouses, Bankside; Purday's warehouses, Mark Lane; and among his earliest works was the widening of the bridge over the Medway at Rochester, and forming the two centre arches into one; this was a work of great difficulty, and was accomplished successfully: he submitted, about the year 1818, designs for a new bridge of five arches, for the site where the present one is now being erected. In 1814 he was engaged, in conjunction with Mr. Dance and Mr. Chapman, the civil

engineer, by the City of London, to survey and report on the state of Old London Bridge. In 1796, he was appointed surveyor to the London Dock Company, and completed in seventy days the original and very correct survey of the site for the proposed docks, which was published by Faden in 1797. The lighthouses of Harwich, of Heligoland, of Holyhead, of Lundy, and three on the Ferne Islands, were executed by him as surveyor to the Corporation of the Trinity House. Amongst the chief of his works were the buildings in the London Docks until 1831; the prison of war at Dartmoor (illustrated in ACKERMANN'S *Repository* for 1810, p. 163,) finished about 1808, at a cost of upwards of £200,000; it consisted of five large prison buildings, placed radiating, and contained much beauty of design and many contrivances of interest; 8,000 prisoners, with lodgings for a guard of 800 men, were contained within its inner circle of walls. This prison has been lately repaired and altered for the reception of convicts, stripping it of much of its characteristic features. The county prison (without the assize courts) at Maidstone, 1810-1817, cost about £180,000. He rebuilt the Moat, near Maidstone, a seat of the Earl of Romney; executed some important alterations at Longford Castle and Downton church, Wiltshire; additions to Beddington House, Surrey, and to Combe Bank, Kent; also repairs and extensive additions to the Queen's House at Greenwich, amounting to about £170,000, whilst adapting it for the Naval Asylum (1807); and Coleshill House in Berkshire, two of the works of Inigo Jones. Mr. Alexander was complimented by Sir John (then Mr.) Soane, in his lectures at the Royal Academy, for the scrupulous exactitude with which every part had been preserved in these restorations. The late Earls of Egremont, Romney, Radnor, and Lord Folkestone, were his patrons among the aristocracy. Amongst his many pupils were the late Messrs. W. H. Ashpitel, James Beck, Joseph Woods, James Savage, and Messrs. John Whichcord of Maidstone, James Pritchett of York, Edw. P'Anson, John Wallen, and Richard Suter. He died at Exeter, 2nd March, 1846, and was buried at Yarmouth, in the Isle of Wight, the tower of which church he had raised, at his own expense, the better to mark the channel at that part. An interesting notice appeared in the *GENTLEMAN'S MAGAZINE* for August in that year, compiled it is believed by Mr. Suter. *

ALEXANDER'S great forte consisted in original and novel ideas of construction, which doubtless contributed to his signal prosperity. When just out of his articles, he executed the large establishment No. 48 Mark Lane, then known as Purday's warehouses: one portion of this building, consisting of a lofty pile for colonial produce, sixty feet square, is roofed by an **M** roof, hipped at both ends, and carrying its own gutter-plate, but without tie-beams, collar-beams, struts, purlins, or any of the usual methods of roofing large spans; in fact, the eye looks up to the ridge without seeing any intervening timbers. This may serve as an instance of his skill. The tobacco warehouses at the London Docks, which cover seven acres of ground; the many acres of arched and groined wine vaults, and the ranges of buildings called the North and South stack warehouses, exhibit the extensive nature of his works, and will repay inspection; while the prison at Maidstone affords striking evidence of his power of design and constructive skill. This edifice, constructed with the local limestone rough hewn on the face, and laid with a rough tooled arris, is more picturesque than Newgate (the best prison in the world, according to the French critics), inasmuch as the stonework of the London prison has an evidently artificial roughness, whereas the grim gloom and repulsive character of that at Maidstone is a natural rudeness. When the weighty gates of the really massive portal are opened, the visitor sees a roof of the extraordinary and novel construction of fan tracery (in gauged brickwork), as perfect and as correct as any fan tracery in mediæval architecture, excepting that of course it has neither groin ribs, ridge ribs, nor liernes. The houses devoted to the turnkeys are primarily

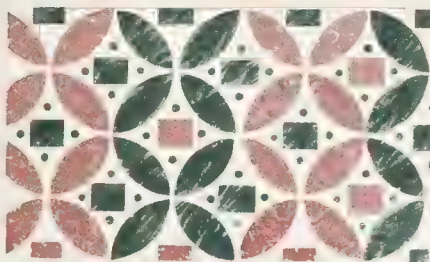
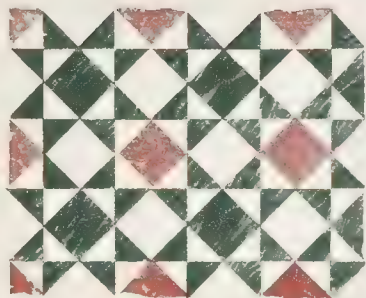
constructed for general supervision; on the ground floor they are quadrangular in plan, the sides being boldly curved inwards, and the windows having low, rude, rough, and frowning rustic arches (in fact, the architectural visitor is strongly reminded of the *Carceri* of Piranesi, which was a work very delightful to Alexander); from the four corners of these houses, four ribs of brickwork rise and meet at the height of about forty feet, forming a sort of perforated paraboloid, which with the cylindrical shaft in the centre support the superstructure: perhaps the best illustration would be to take the half of an egg-shell, and making four large apertures therein, rising towards the top, to finish them in an arched form, so as to leave the crown nearly entire; or to fancy four enormous slices cut out of the dome of St. Paul's cathedral, leaving its crown and lantern standing on four narrow ribs. The roof and turret of the chapel, and the keeper's house, are not now as they were originally constructed. The turret, formerly of stone, weighing about fifty tons, was wholly supported by eight detached concentric brick ribs, in which were the flues from the apartments below. The ranges of cells, etc., are entirely of stone or brick, the arches being groined or not, as best suited the purpose of the architect. The roof is carried by an ingenious system of pointed arches in 9 in. work, with spandrils filled in with 4½ in. work forming the principals, the ridges are cambered arches of 4½ in. work, the slate-battens are iron rods, and the gutters are sunk out of the solid stone, so that there is no woodwork whatever in the prisons, except the oak doors of the cells. It is probable that, unless Alexander's works are collected and delineated, a considerable time may elapse before his reputation is established on the appreciation of his talents. A. A.

His eldest son DANIEL practised with great promise and success, but left the profession in 1820 for the Church, and died vicar of Bickleigh in Devonshire in 1843. Independent of the assistance given to his father's works, the little church and tower of Walton-on-the-Hill, near Epsom, and the library at Beddington House, near Croydon, were designed and executed by him in 1818. *

ALEXANDRIA in the Sardinian States, see ALESSANDRIA DELLA PAGLIA.

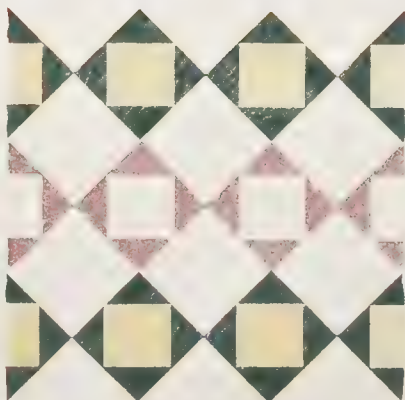
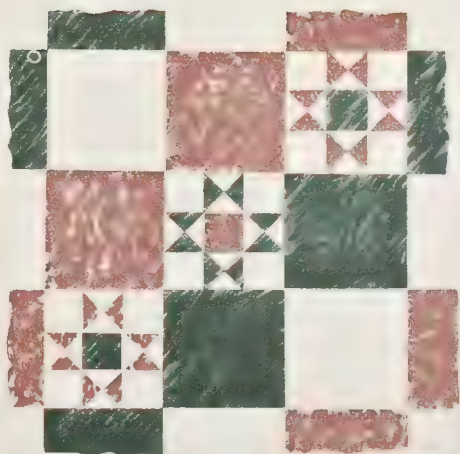
ALEXANDRIA. The great Mediterranean port of Egypt. The city, designed by Deinocrates, was founded by Alexander the Great, and erected under the superintendence of the general Cleomenes, in the year 323 B.C. It was laid out in parallelograms, the streets being at right-angles to each other, and two main thoroughfares bisecting the city in opposite directions; each of them was 200 feet wide, and one about four miles, the other about three-quarters of a mile, in length between the gates. The Pharos, built by Sostratus for Ptolemy Philadelphus, was accounted among the wonders of the world by those who received literally the account given by STRABO, xvii. The present prominent remains of this Greek and Roman Egyptian city are very few: the cisterns were constructed of considerable size beneath the houses, and coated with a thick red plaster, having the brick or stone vaulted roofs supported by rows of columns, sometimes ranged in several stories; they were supplied by an aqueduct from the Nile, and continue even now to be used for their original purpose; they indicate the ancient locality of the city, as upwards of three hundred and fifty were counted about the year 1800. The well-known obelisks of red granite, called Cleopatra's Needles, brought from Heliopolis by one of the Cæsars, still mark the site of the Cæsareum, or temple of Cæsar; they are situated in the Frank quarter, in the lowest part of the city, and near the water's edge; one only is erect, it is monolithic, 70 ft. in height without the pyramidion, which is calculated at 3 ft. in height; the diameter at the base of the pyramidion is 4 ft. 10 ins., and at the base of the shaft 7 ft. 7 ins.; the pedestal is said to have been 8 ft. 10 ins. high: and the fallen one, which had been presented by the viceroy Mehemet Ali to the English nation, has lately been condemned as too much decayed and injured to be worth removal. The

OPUS ALEXANDRINUM.



Mosaic in the Vatican ROME

GEOMETRIC CLASS MOSAIC





the teatro Carignano, which was burnt in 1787; the palazzi Barolo and Marozzo; and the interior of the church of the Corpus Domini; at Verceili the curious portico of the duomo; at Asti the seminary, the tower of the church of Sta. Anna, and the palazzo Alfieri; at Carignano the church of S. Giovanni Battista; at Stupenigi the royal riding school, of which his namesake the poet says "volta dottissima ed audaciosissima"; at Alessandria, the palazzo Ghilini, above mentioned; and at Geneva the façade of the church of S. Pietro. Besides these works, he exercised considerable influence on the architecture of Turin, both by the designs which he made for his friends and others of the nobility, and by the numerous drawings which he left to the world at his death, 9 December 1767. PAROLETTI, *Vite etc., di Piemontesi Illustri*, fol. Turin, 1824. 60.

ALFOMBRA. The Spanish word, derived from the Arabs, for the last coat of the plaster floor of a dwelling. ALCATIFA. 66.

ALFONSO, see ALONSO.

ALFRIDUS, see SALZBURG.

ALFUN, ALDHUN, or ALDUNE (BISHOP) see DURHAM.

ALGARDI (ALESSANDRO), born at Bologna about the year 1600, was the son of a merchant, and a pupil of Ludovico Caracci: having visited Rome, he was occupied there until the age of thirty-eight as a sculptor. The celebrated villa Pamfili at Rome, called the Belrespiro, situated about half a mile beyond the Porta S. Pancrazio, on the Via Aurelia, was executed by him for one of the nephews of Pope Innocent X, about the year 1644. The plan is imitated from one by Palladio; and the interior was decorated by Francesco Grimaldi. PERCIER and FONTAINE, *Choix des plus célèbres Maisons de Plaisance à Rome*, etc., fol. Paris, 1824, second edit. For the same Don Camillo Pamfili, he erected the high altar in the church of S. Niccolò da Tolentino. The façade of the church of S. Ignazio (AILERON) is also due to Algardi. He was created a cavaliere, died 10 June, 1654, and was buried in the church of SS. Giovanni e Petronio. Giovanni Maria Baratti was his pupil. 54.

ALGECIRAS, or ALGESIRAS. A city and seaport, once the seat of a bishopric in the province, but now united to the see, of Cadix in Spain. The old town, built on the Isla Verde by the Moors, was taken from them in 1344; it is now little more than a heap of ruins. The modern town is nearly opposite, it was founded in 1760 as a "hornet's nest against Gibraltar", and occupies an acclivity rising rather rapidly from the sea; it is well built, with wide, paved, and clean streets, and three *plazas*. The public fountains are supplied by an aqueduct built in 1784, by Don Pablo Casaus; it is carried upon two ranges of arches, one being 500 paces long, and 25 feet high to the underside of the keystone, the other consisting of forty-three arches, of which the largest is 45 feet high. The city contains only one parochial church, begun in 1738, and consecrated in 1829: the campanile, 150 feet high, but still unfinished, was commenced by Barranco, and continued by Don Isidro Casaus. A monastery is now converted into the prison, and its church serves for a chapel. There are three other chapels, a public school for 1,000 children, a town hall and court house, a military hospital, with a civil hospital and foundling asylum in the same building, infantry and cavalry barracks, and a theatre. 46.

ALGHIERO (the Latin ALGARIA). A town and seaport in the island of Sardinia, made the seat of a bishop in the beginning of the sixteenth century. It has a handsome cathedral church, dedicated to the Virgin Mary, twelve churches and convents, and a seminary or college. 75.

ALGHISI (GALASSO), a native of Carpi, wrote a work, *Delle Fortificazioni*, fol. Venice, 1570, and was employed on the church of Sta. Maria di Loreto, and on the palazzo Farnese at Rome. There is a large engraving of a vast palace designed by him, with the inscription "Alghisii Carpenis apud Alphonsum II, Ferrariæ Ducem architecti opus, 1566. 85.

ALGIERS (Arabic *El-djezaïr*; Fr. *Alger*). A city and seaport, which, since 1830-31, has been the capital of the French colonial province of Algeria, on the north coast of Africa. It

is defended by a wall 12 ft. thick, and 30 ft. high, with four castles and five gates. The streets are mostly narrow, crooked, and dirty, with houses ranged as in an amphitheatre, the upper portion terminating in an esplanade, occupied by the kasbah or old citadel, which is in itself a small town, comprising the late dey's palace, not much damaged by the French soldiery (see illustration COURT (Algiers) and description), and several other houses and gardens. The principal street was about 1,200 paces in length, by 12 in width; but the French government has constructed three long thoroughfares, which are tolerably wide, and as many *places*. The city once contained, it is said, sixty mosques: the *Guide en Algérie*, 1847, accounts for only ten; of these, one is reported to be sixty feet high, by forty feet square, and three stories in height. In 1830, the French government added a portico to the grand mosque. It is probable that many of the other mosques furnish the structures for some of the other public buildings, which include a modern cathedral, described by BOURASSÉ, *Cathédrales de la France*, 8vo. Tours, 1843, as of *architecture Arabe; influence Byzantine*; several churches, a Protestant chapel, six colleges, and some convents used as female schools, several synagogues, a palais du gouvernement, an exchange, four courts of justice, a bishop's palace, a public library, a museum, an observatory, several hospitals, and extensive barracks. The banks, bazaars, markets, hotels, and cafés, already render Algiers highly creditable in an architectural point of view to its present possessors. A. BERBROGER, *L'Algérie historique*, etc., fol. Paris, 1843.

ALGIERS. The houses as they rise from the ground approach each other from the opposite sides of the streets, and are rectangular blocks in plan, with walls of two and three stories in height, pierced externally with small holes to let the air pass through, but rarely furnished with windows. A low entrance door or gate opens into a courtyard, generally flagged or tiled, and sometimes even ornamented with a coloured pavement, representing different subjects. This courtyard can be covered in the rainy weather with canvas. Venetian blinds are used in hot weather for the rooms, which open on galleries looking into the courtyard, and consist of an entrance-hall, with a room on either side, and a passage round to the principal apartments in the rear. The bishop's palace is a newer construction, not in the Moorish style, having a balustrade surmounting walls of Italian marble. The interior decorations are nearly the same in every instance, the subbase or dado is covered with bright-coloured tiles, the floors are of mosaic work, the ceilings heavily framed and gilded, and the walls either painted or stuccoed with arabesques: in some cases, the stone cornices are exquisitely chiselled in lace and fretwork, having projecting blocks with grotesque faces or heads. The poor reside in the same description of buildings of large courtyards, small rooms, and flat roofs. The new portion of the city has wide streets and squares, though the natives consider the old tunnel-like lanes or passages more consonant with their feeling of comfort. w. H.

ALHAMA. A city of the province of Granada in Spain, so called on account of the two ancient mineral baths still existing about a mile from the town: the smaller, which is circular, is used by the poorer classes, and may be a Roman work; the larger one is exactly in the same state as when the Moors quitted the town. They are fully described by MADDOX, *Dictionario, etc., de Espana*, 4to. Madrid, 1846. The ruins of the aqueduct which supplied the castle are still visible. The town comprises two *plazas*; a Gothic parish church, and three conventual churches; a town house and court of justice, formerly a monastery; a prison; three schools; an hospital; and a theatre, built by the Society of Arts and Sciences in 1840-42. 46.

ALHAMBRA. The stronghold and palace of the Moors, near the city of Granada in Spain. Some authors seek to derive the name from a monarch Alhamar; others find its origin in an Arabic term, *dar-al-amra*, or royal dwelling; while DE GAYANGOS is satisfied with *Khelat al-hamrá* or "red castle", from the oxide of iron contained in the earth of the site.

The fortress is situated at one extremity of the city of Granada, and the visitors pass through an *alameda* and the gate of justice into the precincts of the Alhambra proper. A winding path conducts into the plaza de los Algibes, on the left hand of which is the *alcázar* or citadel, now tenanted by convicts; on the right is the palace, of bold Italian architecture, with an inner circular court of striking proportions, erected by Charles V, 1516-1555, for which a portion of the *casa real* was destroyed, all that remains of the ancient palace of the Moorish kings. Still further beyond those buildings formerly stood the great mosque and house of the Cadi, which existed at the time of the French occupation, 1809. The walls of the fortress are studded with towers, those on the north side serving for the royal residence. The Alhambra offers the most perfect model of the style of the fifth and last of the periods into which GIRAUD DE PRANGEY has divided Arab architecture, or of the third epoch of that art in Spain, when for about two centuries architecture was purely Moresque: everything built at the Alhambra during the sixty years previous to 1391 was built in this style, which is recognized at a glance by the varied combinations of the geometrical figures, explained by Mr. Owen Jones as composing the system of corbelling which forms the pendentives, arches, and roofs, greatly assisted by the method of colouring adopted; by the beauty and variety of the ornaments; and by the Cufic inscriptions intermixed with geometrical figures and foliage, which address themselves to the eye of the observer by the variety and elegance of the characters, and exercise his intellect by the difficulty of deciphering their curious and complex involutions. Nowhere can the luxury of this style be found displayed in so much profusion and preservation. The Moresque palace is supposed to have been commenced between 1232 and 1272, and to have been continued with little interruption perhaps until 1391. The edifice is described by GIRAUD DE PRANGEY, *Architecture des Arabes*, 8vo. Paris, 1841; *Monumens Arabes et Moresques*, fol. Paris, 1840; *Souvenirs de Granade*, fol. Paris, 1837; *Choix d'Ornemens Moresques de l'Alhambra*, fol. Paris, 1847: and has been also illustrated by MURPHY, *Arabian Antiquities*, fol. Lond. 1813; LEWIS, *Sketches, etc., of the Alhambra*, fol. Lond. 1835: but above all by GOURY and JONES, *Plans, etc., and Details of the Alhambra*, fol. Lond. 1842. It is said to be proved beyond a doubt that the timber, which is in excellent preservation, is red pine; cedar is introduced with the red pine for fine mouldings and carved work. The science of ventilation by hot and cold air, and the absence of reverberation in the rooms and passages, deserve special attention upon the spot. W. H.

ALICANTE (the Latin *LUCENTUM*). A city and seaport of the province of the same name in Spain. It has four gates, clean and well-paved streets, containing lofty stone houses, with terraces and verandahs; four large, and several small *plazas*; three parish churches; that of S. Nicolas, considered one of the most striking churches in Spain, is collegiate, and of the Doric order; it was designed, it is supposed, by Agustin Bernardino, who commenced the foundations 9th March 1616; he was succeeded by Martin de Uceta, by Pedro Guillen, and by Miguel Real, who finished it in October 1662. An episcopal palace; a college; a museum; a picture gallery; public baths; eight fountains; a large and striking town hall, with a prison attached; seven hospitals; some large magazines; a temporary theatre; twenty-three schools, besides those of navigation, commerce, and botany, and several literary, scientific, and artistic associations; three public laundries; and the ruins of nine monasteries and convents are the other features of interest. 46.

ALICATADO. The Spanish term, derived from the Arabic, for works executed with *azulejos*. The verb *alicatador* is now used to express the laying of the *azulejos* in bands or panels on walls or pavements; whereas the proper signification is to cut or scrape the tiles, before fixing them, in order that they may fit each other. 66.

ALIEN PRIORY. During the two first centuries after the Conquest, estates were often transferred to Norman abbeys,

for the benefit of the souls of the donors: the foreign monasteries caused cells to be erected upon such property, or sometimes merely built granges; these buildings were occupied by monks of the same order as those in the parent abbey, which generally sent over the requisite number of monks, and appointed the prior who was to govern them. All the alien priories were suppressed 2 Henry V, except those which were sufficiently independent of the parent abbey, in the application of the revenues, and the election of the priors. DR. TANNER thinks there were no alien priories established after the reign of Edward I, and states that the whole number previously founded was 96. The *Monasticon* contains 100; WEEVER estimates them at 110; and in the *History of Alien Priories*, 2 vols, 8vo. 1786, a list is given of 146, which number is probably more correct than that of "190 and more", mentioned by SPELMAN. WEALE, *Dict. s. v.*, gives a list, etc., containing 107 names.

ALIFE (the Latin *ALIPHA*, *ALLIFA*, or *OLIFA*). A city in the province of the Terra di Lavoro, in the kingdom of Naples, and the seat of a bishopric united to that of Cereto-é-Teleso, the episcopal residence being at Piedimonte. It was burnt in the time of the Emperor Frederick II (1212-1250), and from its notorious insalubrity, has remained in ruins. The city is only remarkable for the old cathedral, dedicated to S. Sisto, and a convent. 75.

ALIGERI, according to the Veronese and not ALIGHIERE (FRANCESCO), sixth in descent from the poet, studied literature and architecture with considerable success. He translated Vitruvius; and, in the design of the monument to his two brothers in the church of S. Fermo at Verona, he very much followed the elevation of the Arco di Gavii, built by L. Vitruvius Cerdo in that city, which was destroyed by the French under Napoleon. 28.

ALIGNMENT. A term, borrowed from the French, to express the line laid down by authority for a road, street, or row of houses; although generally understood to imply lines that are straight, the term is also given in practice to those that are curved.

ALIO (MATTEO and TOMMASO), surnamed GUARO, and living at Padua in the year 1653, are mentioned by BRANDOLESE, *Pittore, etc., di Padova*, 8vo., without any detail of their architectural works.

ALIOTT, more properly ALEOTTI.

ALIPTERIUM (Gr. *ἀλιπτήριον*). The name given to the anointing room in the baths and palæstræ of the Romans: also called *eleothesium*, *unctuarium*, or *ceroma*. 13.

ALIZIER. One of the chief native woods of Egypt, used for the material of implements in that country. 71.

ALJAMA, see DJAMA.

ALKALI. The chemical term which is applied to substances possessing the following properties. They are incombustible, can convert vegetable blue into green; they readily corrode the flesh of animals, and are hot and caustic to the taste; they are soluble in water, and are found in combination with acids, when they form new bodies—either in their pure state, or from the acids with which they combine.

Alkalies are divided into two kinds, *Fixed* and *Volatile*. The *Fixed* alkalies are subdivided into vegetable and mineral. Vegetable alkalies are produced from the burning of vegetable matter in the open air; and, according to their purity and quality, are termed potash and pearlash. Pearlash has been found native; soda is produced from the ashes of marine plants. Both the fixed alkalies enter largely into the manufactures, and are a necessary ingredient in the composition of glass; they endure an intense degree of heat without dissipation. Saline vegetables produce the largest quantity of alkaline matter.

Volatile alkali, termed also ammonia, is produced from animal substances by distillation; in its pure state it is a pungent gas, and almost invisible.

Alkalies are also called *Mild*, or *Caustic*. The *Mild* alkali is that which is found combined with carbonic acid, which moderates their action, and causes them to effervesce with acids.

The *Caustic* alkali has the carbonic acid separated from it by lime, which renders the alkali more pure, and increases the energy of its action on matter.

The use of the alkalis in testing stone and other of the building materials, and proving either the power of stability or liability to decay, and the simplicity of the method of trying the experiment, are sufficient reasons for the extent of this notice. When the trial was made on several cubic pieces of sandstone, both red and grey, they were dipped in a solution of strong or concentrated soda, and when saturated, each block was hung by a string in the air; some were disintegrated, and others remained uninjured, after a few days' exposure; this is sufficient proof to show that the chemical action of an alkali is the same on the stone, etc., as the lengthened exposure by time and the change of atmosphere. This test is useful in the choice of stone, even from different parts of the same quarry, as the Portland and Anston quarries have given imperfect specimens, as seen in our public buildings. W. H.

ALKMAAR (the Latin ALEMARIA). An old town in the province of North Holland, in the kingdom of that name. It is a clean, well-built town, containing nine churches, one of which, dedicated to S. Lawrence, is a handsome edifice, dating from the fifteenth century; a synagogue; two tribunals; an elegant structure called the weigh-house; a highly decorated town hall, begun in 1509, and said to resemble on a small scale the hôtel-de-ville at Brussels; an arsenal; a custom house; two markets; a theatre; four hospitals; a house of correction; and several scientific and literary institutions.

ALKORAN, see ALCORAN.

ALKSAR (probably properly ALCAZAR). A town in Morocco, containing a great number of spacious mosques, with narrow streets, arched across at intervals. The houses have ridged roofs of tiles. The town is enclosed by a battlemented wall, with towers at every fifty paces distance, and is surrounded by orchards and gardens of pomegranates, oranges, and palm-trees. 50.

ALLAHABAD. The capital of the province of the same name in Hindostan, ceded to the East India Company in 1801, was once a vast brick-built city, founded by the Emperor Akbar, in 1583. There now remain scarcely anything more than several square miles of quite dilapidated ruins. The two principal edifices now existing, both very magnificent examples of Hindoo architecture, are the fort or citadel, which has a dome and cupolas supported by forty pillars; the principal mosque, called the Jumna Musjeed, which is in tolerably good condition; and the caravanserai of the Sultan Khosrou. Adjoining to this are three mausoleums of former rulers, which are large terraced structures, containing vaulted chambers; in the central room of each is a richly carved stone sarcophagus, and above is a circular domed apartment, painted on the inside, and highly decorated with sculpture externally. The tombs and minor temples along the bank of the Ganges are similar to those usually seen throughout India. W. H.

ALLASON (THOMAS), born in London, 31st July 1790, was a pupil of William Atkinson. He obtained the silver medal of the Royal Academy of Arts in London, 1809; a gold pallet medal of the Society of Arts, etc., 1810, and a silver medal of the same Society, in 1816. He studied Grecian architecture, being confirmed in that style by a tour on the continent and through Greece in 1814, as draughtsman to the Messrs. Spencer Stanhope, for the publications on the *Topography illustrative of the Battle of Plataea*, 8vo. Lond. 1817, and a folio volume of plates; and for the *actual state of the Plain of Olympia, and of the ruins of the city of Elis*, fol. Lond. 1824. On his return, he published *Picturesque Views of the Antiquities of Pola in Istria*, fol. 1817; and also an etching of Milan cathedral. During his researches in the Morea, he was the first to observe the peculiarity of the entasis of columns, afterwards confirmed by the measurements of Messrs. Cockerell and Haller. QUARTERLY JOURNAL OF ARTS, No. xix, 1820.

His chief architectural public edifice was the Alliance Fire Office, Bartholomew Lane, London, 1841, to which company he was surveyor from its commencement, in 1824, to the day of his death. This position introduced him to the families of Rothschild, Montefiore, and Ricardo. At Alton Towers, for the late Earl of Shrewsbury, he designed additions to the mansion, and was engaged in laying out the gardens: from this period he was much employed as a landscape gardener. He superintended the repairs and redecoration of Blenheim palace, the cost of which exceeded £20,000, under an Act of Parliament passed for that purpose. His pencil also supplied various designs for furniture and decorations. Besides the execution of many villas and mansions during his career, he had just completed at the time of his death, the erection of Pyrgo Park, near Romford, for R. Field, Esq.; and Sulhamstead Park, near Reading, for M. G. Thoyte, Esq. He held the appointments of surveyor to the Pollen estate, and Stock Exchange, London; the d'Este estate, Ramsgate; the Ladbroke estate, Notting Hill; the Pitt estate, Kensington. He was a commissioner of sewers for Westminster and part of Middlesex; and was appointed one of the Board when the Commission was for the second time remodelled. His only pupil was Charles Day. He died, after a few days' illness, 9th April 1852, in his sixty-second year. One of his three sons, Thomas, has succeeded to most of his appointments. T. A.

ALLEMAGNE. A parish and village on the right bank of the river Orne, about two miles above Caen, in France. It is noted for the quarries from which the oolitic stone, named after that place, is procured. CAEN STONE. W. H.

ALLEN (GEORGE) F.R.I.B.A., born at Brentford, April 14, 1798, a pupil of James Elmes, obtained in 1820 the silver medal of the Royal Academy of Arts in London. He was engaged in 1826 and afterwards, with the late Mr. Savage and others, on behalf of Mr. Peto, in making surveys and reports, and in giving evidence, regarding the failure of the foundations of the Custom House; on which, and on many other occasions in the course of his practice, he displayed great firmness and self-possession whilst under cross-examination, as well as considerable talent in the composition of reports, memorials, and business correspondence. In 1827 and 1828, he gave earnest attention to, and published *Plans and Designs for the future Approaches to the New London Bridge*, etc., 8vo, as well as the isolation of S. Saviour's church; several of his suggestions were adopted, without pecuniary benefit to himself, but these exertions procured him extensive employment, as at S. James's church, Bermondsey, 1823, in conjunction with Mr. Savage; the restoration of the church of S. Olave, Tooley Street, after its damage by fire in 1843; Christchurch, Bermondsey, 1847; the Union Workhouse of the parishes of S. Olave and S. John, 1839; S. John's Girl School, 1845; Brentford Infant School, 1837; London Bridge Hotel, 1834; Fenning's Wharf, 1836; Cotton's, Topping's, Davis's, and several other wharfs. He was employed in valuations for the Richmond and Staines Railway; the Greenwich Railway Joint Station at London Bridge; the parishes of S. Olave and S. John; S. Nicholas, Deptford; S. Benet's, Cornhill; and Rotherhithe; the South Eastern Railway; the Rochester Gas Works; South Metropolitan Gas Company; Pitcher's Dock; the Victoria Dock Company. He was surveyor to the Haberdashers' Company, the Deptford Creek Bridge Company, the district of Rotherhithe and Hatcham, the parishes of S. Olave and S. John, and S. Nicholas, Deptford. He died 28th June 1847, and was buried at Sydenham. J. J. S.

ALLEY (Late Latin, *alleia* or *aleya*; It. *viottola*; Sp. *callejuela*; Fr. *allée*; Ger. *gavsschen*). In French houses, the name is given to that passage which is common to the occupants of each floor, and which leads to the courtyard, if there be one, or to the staircase. The passage of communication between rooms, also called a CORRIDOR, sometimes receives this title. It has also been applied to the path or walk between the seats in a church;

and in the old surveys of cathedrals, "the dean's alley, the chaunter's alley, the cross alley", are mentioned: the old words *ALUR*, *ALURE*, *ALURA*, and *ALLIENY*, are used in the same sense. The word is applied, in the Metropolitan Buildings Act, 7 and 8 Vict. c. lxxxiv, to any "court, alley, passage, or other public place, which can be used as a footway only"; and every such alley is to have two entrances, each being the full width of the alley, and one of the two, at the least, open from the ground upwards. In general use, the term signifies something more than a passage, in having house-entrances; and more than a court, in being a thoroughfare for foot passengers. In like manner, a covered or pleached alley, and an open alley in gardens, being straight parallel walks, at least five feet wide, bordered with trees or shrubs, are, when at their utmost limit of fifteen feet in width, distinguished from an *AVENUE* or *DRIVE*, by not being used for carriages. *PATH. WALK.*

ALLEY. An old term for *AILE*.

ALLIENY. An old term for *ALURE* and *ALLEY*.

ALLIPRANDI (JOHANN B...) was residing at Prague, as a government architect, in the year 1708. 26.

ALLOA. A riverport town of the county of Clackmannan in Scotland, is remarkable for the ancient square tower, 90 feet high, with walls 12 feet in thickness, built towards the end of the thirteenth century; and for the church, in the Grecian style of the present century, with a spire 207 feet high. The town also contains five chapels. The streets are well paved, and cleaned, and the new buildings begin to give a handsome appearance to the town. John Street, 80 feet wide, leading to the harbour and to an avenue of lime-trees, is highly esteemed in Alloa.

ALLOTMENT. The portion given to each individual as his share of ground, etc. In laying out property for sale or building, considerable difficulties arise in equalising the advantages to be divided, especially where the lots are to be of the same value: and in apportioning out allotment gardens, it must be remembered that experience has not yet decided, whether they should consist of a rood of ground or less, or whether they ought to be an acre in extent. This part of the subject will be found treated in the *PENNY CYCL. SUP. s. v.*

ALLOY (It. *lega*; Sp. *liga*; Fr. *alliage*; Ger. *vermischung*). The name given to the result of the fusion together of different metals, in proportions which at present are infinitely varied. This mixture changes the properties of the metals thus combined, for they either become more sonorous, or more hard, or more fusible, etc.; and some alloys have a density less than the mean of their constituents, while in others it is greater. When mercury is employed, the special term used for the alloy is *AMALGAM*. The mixture harder than any metal is tin 6, lead 2; that heavier than any metal, is copper 2, tin 1; that which expands in cooling (and is useful in filling small defects in iron castings, etc.) is tin 9, antimony 1, bismuth 1, lead 1. No alloy of copper and zinc, or of copper and tin, works so pleasantly in filing, turning, or polishing, as when combined with a small proportion of a third fusible metal; for this reason, lead is added to copper with zinc, and zinc to copper with tin. *BELLMETAL. BRASS. BRONZE. GUNMETAL. LATTEN. SOLDER.*

ALMAGRO. A city in the province of Ciudad Real, in Spain. It contains two parish churches, the finer of which originally belonged to the Jesuits. Of the eight monasteries and convents, the most remarkable was that of the nuns of Calatrava, the cloisters of which are decorated with columns and balustrades of jasper and alabaster; the church, now in ruins, corresponded in magnificence. The *Plaza de Toros* is on the site of the monastery of the order of Calatrava. The university existed from 1553 until 1824. The *Plaza Mayor* is 345 feet long, by 121 feet wide, with a portico on each side. The city also possesses a town hall, abattoir, and barracks, originally forming a palace of the order of Calatrava. 46.

ALMANSA. A city in the province of Albacete, in Spain. It contains about 1,784 houses; a church, with a tower of con-

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siderable height; a modern *casa capitular*; a public granary; a large prison, with dark and frightful dungeons; a covered public laundry; a monastery; a convent; cavalry barracks for 900 horses, erected at the end of the last century, but now abandoned, and only kept in repair by being partly occupied as an inn; two schools; and an hospital. 46.

ALMARIOL (*ALMARY, ALMERY, ALMORIE*, the old forms of *AMBRY*). This word, *almariol*, is shewn by SMITH, *Antiq. of Westminster*, 4to. Lond. 1807, p. 204, to be applied in the case of such a closet or cupboard as that in the vestry of S. Stephen's chapel, in which the ecclesiastical vestments were kept.

ALMEHRAB, see *MEHRAB*.

ALMENA (Fr. *merlon*). The Spanish term, probably derived from the Arabs, for an indented trapezium, generally about 2 ft. 9 ins. high, serving as an embattled parapet. *GIRAUD DE PRANCEY, Architecture des Arabes*, 8vo. Paris, 1841.

ALMERIA (the Latin *MURGIS*). The capital of the province of the same name in Spain. The houses are chiefly built with central courts, like the modern Eastern and old French mansions. The Gothic cathedral, dedicated to N. S. de la Encarnacion, was commenced 4 Oct. 1524, and finished in 1543; but the tower yet remains incomplete. It has two large portals of the Doric and Composite orders; the *trascoro* and the stalls, of carved walnut wood, are considered admirable. The whole edifice is worthy of special notice, as being a fortress intended to resist a *coup-de-main* of the corsairs. The church of S. Juan, formerly a mosque, with four other churches; S. Jago, 1553-1559; S. Pedro, once a mosque, and now rebuilt; *el sagrario*, communicating with the cathedral and S. Sebastian, 1673-84, with its Composite façade and Ionic interior, are the chief buildings. There were four monasteries, of which that of S. Domingo, once a mosque, is now a college; that of the Trinity is converted into private warehouses; and that of S. Francisco was finished in 1800. There were also two convents; that of the Concepcion, 1515; and that of Sta. Clara, now the offices of the municipality, and of the provincial assembly. In one of the five *plazas*, that of the Constitution, the houses have lately been built so as to leave an arcaded portico. The *Casa del Ayuntamiento* was ornamented in 1814 with five arches, and an order carrying a gallery or loggia, and two towers at the angles. There are also, a badly arranged prison; a theatre; ten schools; two hospitals; and a society of arts, agriculture, and commerce; two alamedas; and the ruins of a Moorish fortress called the *Alcazaba*. 46.

ALMERICO is mentioned by Milizia as one of the architects by whom the cathedral at Padua was altered, between the epochs of Sansovino (1479-1570) and Squarcino (1756).

ALMERY. An old term for *AMBREY*.

ALMIMBAR, see *MIMBAR*.

ALMOCARABE, or *MOCARABE*. The Spanish word, derived from the Arabic term for interlacings of knots, and used to express ornaments of that sort; the word is also written *almorabe*, and employed interchangeably with *AJARACA*. 66.

ALMOND (Fr. *amande*). The name given to those pieces of glass, cut upon the wheel into a figure resembling the fruit of the same name, which are seen in old-fashioned chandeliers, and other furniture made of glass. 13.

The moulding commonly called *EGG AND TONGUE*, has been supposed to be representations of arrow-heads alternating with the stones or pieces of metal, shaped like almonds, which the ancients discharged from slings, of which the fillet surrounding the egg is a representation. 2.

ALMONRY (*elemosinarium, almonarium*; It. *elemosineria*; Sp. *limosneria*; Fr. *aumônerie*; Ger. *almosenhaus*). The place or room in which alms were distributed to the poor by monks, ecclesiastics, and others. In large monasteries it was a building near the church, occasionally on the north side of the cloister, and it sometimes had a priests' hall and other chambers annexed

to it. The almonry of some abbeys was placed at a distance from the main buildings; the gate-house was often used, so as to prevent annoyance from beggars. In its fullest development, it contained a refectory, kitchen, buttery, chapel, baths, and the necessary offices for the inmates. An interesting example, attached to the exterior of the south transept of the church at Bishopstone, in Wiltshire, is given in WEALE, *Quarterly Papers*, 4to. London, 1845. AUMBRY. W. H.

ALMORIE. An old term for ALMARIOL.

ALMORREFA. The Spanish word, derived from the Arabic, for brickwork intermixed with azulejos for a floor. 66. ALMS-BOX. A receptacle for public charity, formerly appended sometimes to the doors or windows of the prisons for malefactors, and always to those of the places of confinement for debtors.

ALMS-CHEST. A receptacle for such offerings for the poor, and other purposes, as are not given at the time of celebrating the communion service. The custom of having such a chest provided, is mentioned in the canons of the fourth council of Carthage, where it is called SACRARIUM and *gazophylacium*; and it was ordered in 1 Edward VI, 1547, and by the eighty-fourth canon of the synod of London, A.D. 1603, that one shall be provided in every parish. It was afterwards called *poors-box*, and it has a hole in the upper part, also three keys, one being kept by the parson or curate, and the other two by the churchwardens. 75.

ALMSHOUSE (It. *spedale*; Sp. *hospital*; Fr. *maison de charité*; Ger. *armenhaus*). A building appropriated to the reception of poor aged people, and endowed with revenues for their support. It was sometimes erected in a churchyard, and when extensive, it was provided, as at S. Cross near Winchester, with a church or chapel, refectory, etc. This is the only country which possesses almshouses in abundance, though many such exist in Italy. In England, they appear to have succeeded the incorporated hospitals for the relief of poor and impotent people, which were dissolved by King Henry VIII. After the Reformation, it became a common occurrence for private persons to bequeath large sums as an endowment: the guilds or companies in the city of London have been often selected as overseers or trustees, and have founded their own almshouses, an example which is becoming prevalent with the Benevolent and Trade Societies of the present time. In most instances the almshouses give separate apartments to each recipient of the bounty, or are erected in the form of separate houses, having one, two, or three apartments, each suite having separate entrances; and in this respect the almshouse differs from the asylum. Inasmuch as the occupants may probably be too infirm to ascend steps, it is very desirable in most cases to keep the apartments for the pensioners on a level with the ground. The plan, etc., of the immense almshouse erected on Deer Island, in Boston Harbour, United States, designed by Messrs. L. Dwight and G. J. Bryant, will be found in the *Builder Journal*, vol. viii, pp. 290-294. It was built as a place for English, Irish, French, Germans, etc., who go there by thousands during the warm months, sick, poor, and diseased; and the size of the building is such as to allow four feet by twelve on the floor, and twelve feet in height, to each of 1,200 inmates; that is, about 600 cubic feet of space to each person. The contract price was to be 150,000 dollars. ASYLUM. CHARITY. HOSPITAL. MALANDRERIE. SPITAL. W. H.

ALMUDENA, as the Arabic *al mueddin* or "summoner to prayers", is the name given to a church at Madrid, and to a tower at Tortosa, in consequence of their having been mosques.

ALNUS. The alder. The generic name of a small group of plants belonging to the natural order Betulina. The wood of the common alder is extremely durable if kept in water or wet ground; but it soon rots when exposed to the weather, or to damp, and when dry it is very subject to worms. In France, the sabots or wooden shoes made of it are smoked, to render them hard and impervious to the larvæ of the beetles which attack

the wood. The Dorsetshire woodmen have nearly the same adage for alder poles used as rafters, as those of the midland counties have for willows and poplars, viz.—

"Thatch me well, and keep me dry, heart of oak I will defy."

It is less susceptible of change of shape by casting or warping, than any other of the varieties of hard wood, and therefore makes better weather-boards than elm or beech. For this reason, and from its shrinking very little and resisting dry-rot or changes of the atmosphere, it is used in Sweden and Russia in the roofing of houses, both for the framing and covering. The plank is there used about half an inch in thickness, 6 inches wide, and 9 feet long, in the rough state from the saw-pit, but soaked in a weak solution of lime-water; and when mixed with other descriptions of planking, such as red pine, it retains its strength, probably attributable to the small quantity of vegetable albumen, and the great amount of pyroligneous acid, contained in the wood. LAUDER, edit. of GILPIN's *Forest Scenery*, i, p. 137, after stating that in Scotland the young wood is used for herring barrel staves, narrates that planks when cut from old trees, which are full of knots, have all the beauty of the whorled maple, with the advantage of presenting a deep rich reddish tint; and, in this state, they make most beautiful tables. He then adds, corroborating the above statement, that as the timber is subject to a small beetle, it should be prepared by immersing the log in a large hole dug in a peat bog, and impregnating the water of the hole with a quantity of lime. If this be done, he continues, for a few months, and the furniture afterwards well French polished, it will stand unharmed for generations. The wood, after lying long in bogs, becomes as black as ebony, but has always a dull hue, instead of the brilliancy of it; the colour is white before it is felled, but on being cut it changes to a deep red, fading into a pale flesh colour when dry, which it retains. The colour is nearly uniform; the texture the same; and being light, soft, and working easily, it is well adapted for carving, and for models for casting from. As it does not splinter, it can be used in places where it may suffer very severe blows. Useful to the turner, it is, among other articles, formed into 'Riga' bowls, which stand the application of hot and cold liquids. BETULINA.

Alder wood was formerly much used for piles, and EVELYN, in his *Sylva*, states that he found it used under the bridge of the Rialto at Venice, built in 1591; and VITRUVIUS, ii, 9, and iii, 3, remarked that, in a wet state, it would sustain the weight of very heavy piles of buildings without risk of accident, and that the whole of the buildings at Ravenna, which city is situate in a marsh, were founded upon piles of this wood. In Holland and Flanders it is still cultivated for planking, sluices, pumps, and such purposes. BRITTON, *Arch. Antiquities*, vol. iii, p. 31, states that it was used by our ancestors for scaffolding. Next to the charcoal obtained from the black dog-wood (*rhamnus frangula*), that supplied by the common alder is the quality to be sought. LOUDON, *Arbor. et Frut.* 4 vols. 8vo. London, 1838; TREDGOLD, *Principles of Carpentry*, 2nd edit. 4to. Lond. 1828. MICHAUX, *North Amer. Sylva*, 4to. Phil. 1817-19. W. H.

1. *A. glutinosa*, Common Alder.—A forest tree, abundant in swamps and meadows in all Europe, the north of Africa and Asia, and North America.—Thrives best on banks of rivulets, but not in stagnant water, and when in cultivated grounds it attains to 50 and 60 feet in height; otherwise it rarely exceeds 40 feet.—Arrives at maturity in sixty years.—The foliage being large and of a deep healthy green, it is rather an ornamental tree, and, when old and uninjured, it frequently forms a picturesque object; LOUDON states that it is not applicable to the artificial, but only to the geometrical scenery.
2. *A. incana*, Turkey, Upland, or Hoary leaved *A.*—Europe, from Sweden to north of Italy, N. America, and east beyond the Caucasus.—It is of a more erect mode of growth, and its leaves are destitute of clamminess, but covered with copious white down on the underside.—There are a number of varieties, some dwarfish, but it grows more rapidly (from 50 to 70 feet in height) and to a larger size than the previous sort, and on light land where there are neither rivulets nor ditches, an important property, as it is supposed to possess all the useful qualities of the tree previously described.

3. *A. cordifolia*, heart-leaved *A.* is different in appearance to either of the preceding.—It forms a rather large and very handsome round-headed tree, with broad deep green shining leaves.—Grows with rapidity, and is one of the most interesting ornamental trees that have of late years been introduced into cultivation.—It is perfectly hardy, though a native of the kingdom of Naples, where it is used in ornamental woodwork, and there termed *ontano napoletano*.

Other varieties are chiefly shrubs, as 4. *A. oblongata*, oblong leaved, of Hungary, Austria, and Turkey; 5. *A. serrulata*, cut-leaved, or common alder of N. America, is extremely ornamental when young, from its beautiful green leaves; 6. *A. undulata*, waved-leaved *A.*; 7. *A. viridis*, green-leaved *A.*; 8. *A. Nepalensis* produces a pale brown hard wood, used in Nepal, East Indies, of which country it is a native; and 9. *A. glauca*, black *A.* of N. America, deserves attention from the striking peculiarity of its pale bluish green leaves. 14, 71.

ALNUS. A term applied to that part of the ancient theatres which was at the greatest distance from the stage. 13.

ALNWICK. A parish and market town in the county of Northumberland. The town is chiefly composed of modern stone buildings; in the centre is a market-place, with the town hall, built in 1731, having a spacious assembly room; and the market-house, built in 1827, over which are the new assembly and reading rooms. There are also the Gothic parish church, several chapels, and a mechanics' institute. Alnwick is better known from the castle, which stands between the town and the river Alne, crowning a bank of considerable elevation above the river. The entrance is through a strong tower and a very fine barbican into a space of about seven acres, surrounded by walls and towers, and divided into two courts by the keep. In the middle of the last century, the castle was a ruin, and was made habitable, at very considerable cost, by the then Duke of Northumberland. In the neighbourhood are a number of interesting objects; the ruins of Hulme and Alnwick abbeys, Warkworth castle and hermitage, one or two monuments, Morpeth castle, etc. GROSE, *Antiq. of England*, etc., 4to. London, 1785; ARCHÆOLOGICAL INSTITUTE, proceedings at Alnwick, 8vo. London, 1853; C. F. PERCY (DUCHESS OF NORTHUMBERLAND), *Castles of Alnwick and Warkworth*, etc., 4to., London, 1824.

ALNWYCK (WILLIAM), a native of the parish of that name in Northumberland, became Bishop of Norwich in 1426, and of Lincoln in 1436. Besides several works at Cambridge and Lincoln, he rebuilt the western doorway, and inserted the great window over it, in Norwich cathedral, and built the principal part of the tower gate-house to the palace. BRITTON, *Cath. Ant. Norwich*, p. 63. He died A.D. 1450.

ALOHARIA. The Spanish term derived from the Arabic word for a curvilinear triangle, formed by the intersection of arches. 66.

ALOISIUS is specially styled an architect, in a letter addressed to him by Theodoric, king of the Ostrogoths (493-526), given by CASSIODORUS, *Variarum*, ii, 39, 4to. Paris, 1583.

ALONSO (BARTOLOMÉ) was one of the junta of architects who met on the 20th September 1691, to decide as to the security of the works which had been executed up to that time in the rebuilding the collegiate church of S. Salvador in Seville, after it had once been renewed and fallen down. 66.

ALONSO (MIGUEL) designed, in 1515, and built the nave and chancel or capilla mayor of the church of our Lady de los Remedios, in the city of Laguna in the Canary Islands. 66.

ALONSO, or ALFONSO (JUAN), in the year 1381, directed the construction of the castle of Mouraon, in the Alentejo in Spain; and designed the sanctuary church of the monastery at Guadalupe in Spain. He is supposed to have superintended the erection of this latter building (in which he is buried, with the inscription "A qui yace Juan Alonso, maestro, que fizo esta santa eglisia") from 1342 to 1392. He was probably the father of RODRIGUEZ. 3, 66.

ALONSO, or ALFONSO (RODRIGUEZ), sometimes called brother of the preceding JUAN, was maestro-mayor of the cathedral of Toledo, where he made the designs for the church

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and monastery of the Carthusians at Paular, in the valley of Lozoya; this so-called church is the chapel called "de los Reyes", which adjoins the gateway of the monastery. He was also engaged in building there the royal apartment, which has been converted into a HOSPITIUM. The cloister and the chapel of S. Blas, which belong to the cathedral of Toledo, were commenced in 1389; these, with the bridge of S. Martin at TOLEDO; the Hieronymite monastery of Sta. Catalina, and the collegiate church at Talavera; the archbishop's bridge, and the great hospital at Villafranca; the collegiate church and Hieronymite monastery, with its cloister, at Villaviciosa; and several bridges, small fortresses, and minor buildings, are attributed to him. 66.

ALOOBOA. A native wood of Ceylon, is rather soft, coarse, and open-grained, but not very light. It is used for building and upholstery work. 71.

ALORIUM, see ALATORIA.

ALORYNG. An old term for ALURE.

ALOST. A town in the province of East Flanders in Belgium. It contains a cathedral, dedicated to S. Martin, which is either unfinished, or else has been partly destroyed; the very beautiful portion which remains, is said to have been designed by the architect of Amiens cathedral. The hôtel-de-ville has been recently rebuilt by Roclandt. The maison communale, or trades' hall, was founded in 1200; the tower and balcony in front date from the year 1487. There is also a fine college, an hospital, and a few other public institutions.

ALPNACH. A town in the canton of Unterwalden, in Switzerland, within a few miles of Lucerne. It was celebrated for an incline, called a SLIDE, eight miles in length, formed of rough trees, on which the timber of the forests of Unterwalden was conveyed into the lake of the Four Cantons, and thence taken in rafts to market. Its original name was Altnach. W. H.

ALSIUM, now PALO. A village on the coast of Tuscany, about eighteen miles from the mouth of the Tiber. Here were villas of Pompey and Cæsar, of Verginius Rufus, and of the emperor M. Aurelius. The whole shore to the east of the present village is occupied for more than a mile by the remains of buildings, which are described by NIBBY, *Dizionario di Roma*, 3 vols. 8vo., Roma, 1837, as belonging to the most magnificent scale and style of construction of Roman Imperial times.

ALSTONIA SCHOLARIS (chatayan), and **A. ANTIDYSENTERICA (dudkhuri)**, are woods of Gualpara, East Indies, used for common furniture; the latter tree forms large timber. 71.

ALTAMURA. A city of the province of the Terra di Bari, in the kingdom of Naples. It is irregularly built, being situated on a hill at the foot of the Apennines; there are some fine gates, and it is strongly fortified. The cathedral, founded by Frederick II, 1212-1250, and the university and hospital, founded by King Charles of Bourbon, 1755-1759, are the chief buildings. W. H.

ALTAR, ALTARE, ALTARE, AULTERE, AULTER, AWITER, AUTER, AWTER (It. *ara, altare*; Sp. *altar, ara*; Fr. *autel*; Ger. *altar*). The name given to a consecrated table, generally raised from the ground, and either prepared to receive sacrifices or offerings, or erected to perpetuate the memory of an event, or of the piety of an individual. The modes of consecration were various. When constructed in haste, altars were most commonly made of earth, sods, or stones, collected on the spot; if sufficient time could be given, they were formed of brickwork or masonry; a top, prepared to receive offerings or the fire, was perhaps the first addition, and a base naturally followed: metal was also employed as a material.

By law, the Jewish nation could use but two altars in all their territory: one for incense, which was a small table covered with plates of gold, on which the censor stood; and another for the sacrifice of burnt offerings, which was a coffer of shittim wood covered with bronze, placed before the tabernacle, having a fire continually burning upon it; at the four corners were some ornaments like horns; in the hollow was a bronze grate, on which the fire was made; and the ashes fell into a sort of

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box or drawer; this grate was suspended by four rings or chains, proceeding from the horns of the altar; the whole apparatus was moveable. EAR.

The most ancient ornament of the Jewish altar appears to have been the horns of animals; and this decoration was adopted and continued in classic heathenism. The reason why various marble altars, such as that in the cathedral at Assisi, evidently antique works, are not thus decorated, is, that they were employed as sarcophagi. The celebrated altar of Diana at Delos was composed, according to PLUTARCH, entirely of horns of animals. PAUSANIAS, *Desc. Gr.*, mentions that the altar of Jupiter at Olympia, was about 22 feet high, formed of the burnt femora of victims; and that the altar of Juno at Samos, and of Juno and of Gea or Tellus at Olympia, and of Apollo at Thebes, were of similar materials: the same author also, v. 13, asserts that in his time there existed at Olympia an altar said by the inhabitants of Miletus to have been built of the blood of the victims.

Amongst the fireworshippers, the top of the altar was deeply scooped out; and, from the remains in the Persian ruins, and in temples now in existence, it would seem to have been prepared for the reception of artificial fire, as the visible representation of the Deity. The cut illustrates such an altar, which is known as one of the Ghebir altars of India; they are very common in the Deccan, and are found also in Afghanistan and in the Bombay Presidency. The Cromlechs or supposed Druidical altars are chiefly large stones, laid upon three upright blocks, and sometimes, though rarely, on four blocks as legs. The museum at Turin possesses a round one, with channels to receive the libations, which is asserted to be the only known Egyptian monument of this sort. W. H.

It is probable that the large temples of classic times had three sorts of altars: one for sacrifice externally; another at the foot of the image of the Deity in the sanctuary, for incense and libations; and the third, ANCLABRIS, for offerings, which was portable. It is also supposed that the *altare* was devoted to the *dii majores* and *celestes*, the *ara* or *craticula* to the *dii terrestres*, and the *focus*, *scrobiculus*, or trench, to the *dii infernales*: otherwise, *altare* is regarded as the altar for sacrifice, and *ara* as that for prayer. The difference marked by SERVUS and POLLUX between *altare* as *alta ara* (*ἄλταρα*) and *ara* simply (*ἀράρα*) cannot be overlooked. The form varied: for square, oblong, round, and triangular ones, are found in almost every museum of classical antiquities; but those altars that were made of metal generally resembled a tripod, such as the two fine ones of bronze found at Pompeii, and another, which may be taken to pieces, in the museum of the Capitol at Rome. Those of wood were, according to PAUSANIAS, very rare. When of brickwork or masonry, the altar seems to have been square, as that in the precincts of the temple of Isis at Pompeii. The greater part of those which have come down to the present day are of marble, from eighteen to thirty-six inches high: those that are round are still higher, and the most uncommon; sometimes, when sculptured upon bassi relievi, they are not easily distinguishable from columns. According to MONTFAUCON, the altars of Jupiter, Apollo, Minerva, Venus, Hercules, Bacchus, and Pan, were respectively ornamented with the leaves (*verbenæ*) of the beech, laurel, olive, myrtle, poplar, ivy, and pine; these, treated conventionally, and mingled with the vases, pateras, and instruments of sacrifice, and with the heads of the victims, their garlands, fillets, etc., form the fund of details from which so large a quantity of ornament was derived for the decoration of the classic altars: yet, while some altars have no ornaments but the inscriptions which record the divinity, the consecration, the motive, and the dedicator, others are enriched with bassi-relievi and figures; such are the triangular Etruscan one in the gardens of the villa Borghese, on which the *dii majores* are represented, and

the great circular one in the villa Pamfili, ornamented with figures of deified and consular personages; in this last the places for the charcoal and for lighting the fire are clearly shown, as well as the channels for the blood of the victims. It has been justly remarked that votive altars, marked with an effigy, or with the name and attributes of a deity, must not be confounded with pedestals for statues, which they frequently resemble, even in the form of the inscription: one test, not always to be found, is in the holes for receiving the statue to be placed upon the pedestal. VITRUVIUS (iv, 8) directs the altars of Jupiter and the other *dii celestes* to be as high as possible, yet lower than the statues. ARA. ORIENTATION.

An attempt to explain the difference of opinion which prevails among the different branches of the Christian Church as to the exact definition of the word altar, is beyond the limits of this work.

In the earliest ages of the Church, the altar or table was generally placed towards the end of the church, AMBO. PONTIFICIAL ALTAR; when placed at the east end, it does not appear that it was placed against the main wall, for the bishop's chair stood against the end of the church, and the altar or table was placed in front of it. In the same ages, the simplicity of the Hebrew code was followed to a certain extent; if not in having but one altar in a city, yet in having but one altar in a temple, as there was but one bishop, according to a well-known aphorism of S. IGNATIUS; but in the time of Gregory the Great, A.D. 590, the Roman Church had agreed to introduce more altars than one into a church or chapel, especially at the east end of the aisles, and on the east side of the transepts, as has been the custom since the 10th century on the continent, where each altar is dedicated to a particular saint; thus there were forty-nine altars in the cathedral at Magdeburg. An altar at the west, as well as at the east end, is seen in the cathedrals of Mayence and Nevers, and in two churches at Falaise. At Gelnhäusen; in the church of S. Elizabeth at Marburg; and in the abbeys of S. Alban and Durham, an altar stood outside, and against the great screen of the choir, as remarked by PUGIN, *Treatise on Chancel Screens*, 4to. London, 1851, who adds that altars were occasionally erected in the ROOD LOFT, as at the church of S. Maurice at Vienne. In the oriental churches, it will generally be found that the altar has always stood in the centre of the chord of the middle apse, overhung by a canopy or dome, supported on four pillars, and surmounted by a cross: this canopy, sometimes called the PYROS, is also known by the names *trullus*, *ciborium*, *umbraculum*, *locus columbe*, *peristerion*, and *concha*. A plurality of altars is unknown in the Greek Church; except that in Russia, where the intercourse with Rome has been considerable, it has in a few cases been introduced. ECCLESIOLOGIST *Journal*, iii, 106. PUGIN, *Glossary of Ecclesiastical Ornament*, etc., 4to., London, 1844, has attempted to classify the various species of altars, and in addition to a list of their decorations has given an extract of their history from BOCQUILLIOT, *Traité historique de la Liturgie sacrée*. With regard to the customs of the Roman Church, it appears that its most ancient altars were also surmounted by the abovenamed *trullus* or *ciborium* (this last term is now devoted to express another object), and to this succeeded the BALDAQUIN, which is only the *trullus* in a more showy stage; but this decoration seems to have been reserved for an isolated altar (late Latin, *ara insularis*; Fr. *autel isolé*, or *à la romaine*), placed in the centre of the cross of the church, or at least in advance of the chord of the apse. This is the case in the basilicas, and in the most ancient churches; and the high altar (late Latin, *altare-authenticum*, *altare-capitaneum*, *altare-cardinale*; Sp. *altar-mayor*; Fr. *maitre-autel*), is always isolated, whichever of these two positions it may occupy. The altars which are attached to walls are accompanied by the *contre-retable* and *retable* (ALTAR-PIECE): but some of those which are isolated and placed in the centre of the cross, have no *contre-retable*; such are those of S. Pietro at Rome, and S. Sulpice at Paris. Those altars,

isolated and placed on the chord of an apse, which have borrowed their decorations from the baldachin and retable, have become vast frontispieces, obstructing the view.

Notice must not be omitted of the altar of the chapel della Nunziata in the cathedral at Pisa, famous for the cover of chased work in silver given by Cosmo IV. Among the most interesting of the Italian altars, is the antique altar, ornamented with anchors and dolphins, in the basilica of S. Marco at Venice; the altar of the confessional in the basilica of S. Giovanni Evangelista at Ravenna, a work of the fifth century, and composed of Greek marble, porphyry, and serpentine; that in the church of S. Spirito at Florence, which is formed of rich pietra-dura work; and the Fregosi chapel and altar in the church of Sta. Anastasia at Verona, which was considered by VASARI to be one of the finest in Italy. The high altar of Cologne Cathedral is supposed to be the earliest remaining example of an altar resembling a HIGH TOMB; it was erected by Bishop Guillaume de Gennep in 1346, and is described and figured in GAILLHABAUD, *L'Architecture*, etc., 4to., Paris, 1850, vol. iii, No. 109. Numerous references to engravings of particular examples, and a very useful list of works upon the history, etc., of altars, are given by GUENEBAULT, *Dictionnaire Iconographique*, etc., 8vo., Paris, 1843, s. v. AUTEL.

When the church at Perranzabuloe, near Truro in Cornwall (which is believed to be an ante-Saxon edifice), was disinterred in 1835, the altar was found attached to the east wall, built of stone, and plastered like the rest of the interior. The size was 5 ft. 3 ins. long, by 2 ft. 3 ins. wide, and 4 ft. high, and was placed lengthwise east and west, having square pieces cut out from the north and south angles at the western end. CANOPY. The headless remains of S. Piran were discovered underneath it. HASLAM, *Perranzabuloe*, 8vo. London, 1844. When the similar ancient church at Gwribian, about sixteen miles from S. Piran's, was still more recently discovered, the altar was found built of stone, and standing north and south against the middle of the east wall. In 1076, the council of Winchester ordered the altars to be made of stone; and WILLIAM OF MALMSBURY, 1141, states, *Vit. S. Wulstani*, ii, 14, in *Angl. Sax.* ii, 264, "Erant tunc temporis altaria lignea jam inde a prisca diebus in Angliâ."

The original HIGH ALTARS in existence are at Bridgenorth, in Shropshire; Dulas, in Herefordshire; Tideswell, in Derbyshire; S. Mary's Forthampton, in Gloucestershire, of five pieces of stone, viz. a pillar at each corner, and a table on the top of them, without any bottom stone, 5 ft. 3½ ins. long, 2 ft. 3 ins. wide, and 2 ft. 10 ins. high; the thickness of the slab is 5½ ins., and the upper edge is left square; the lower one is chamfered off to the extent of 2½ ins.; the legs stand 4 ins. under the table, and measure at top and bottom six inches square, the intermediate space being octagonal; this is considered to be almost unique; Arundel, in Sussex, 12 ft. 6 ins. long, by 4 ft. wide, and 2½ ins. thick, placed against an altar screen; S. Mary Magdalene, at Ripon; Dunster and Porlock, both in Somersetshire; this last is solid, and richly panelled with quatrefoils subfoiled in the style of the fifteenth century; it is represented in the GLOSSARY, s. v. According to Bishop HAKEWILL, the total height from the floor, including steps, should be four feet six inches, or three cubits high, which is the measure required in the Levitical law.

Examples of CHANTRY, ORATORY, or CHAPEL ALTARS, called by Bishop Ridley, 1550, BY-ALTARS, still exist; one in the Anglo-Saxon crypt at Repton, in Derbyshire; a solid stone altar at Grosmond, in Monmouthshire; and the GLOSSARY mentions that at Abbey Dore in Herefordshire, standing on three legs; these are supposed to be not later than the twelfth century: that in the chapel of the Pix at Westminster, ascribed to the thirteenth century; those on stone legs at Chipping Norton, and at Burford in Oxfordshire, and those on brackets at Warrington and Shotteswell in Warwickshire, and in the chapel of Broughton Castle in Oxfordshire (illustrated); these are ascribed

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to the fourteenth century: those at Bengeworth, near Evesham in Worcestershire, at Enstone in Oxfordshire (both illustrated), at Arundel in Sussex; at Claypole in Lincolnshire, near Newark; those at Titchborne, a stone slab on wooden legs, and at Christ Church, both in Hampshire: and in Gloucester cathedral, which shows parts of the legs that supported it; these are supposed to be of the fifteenth century: as is also that in the abbot's house at Much Wenlock in Shropshire, which has its front covered with arched trefoil-headed panels. If traces only were to be mentioned, few Gothic churches in England would not enter into the list. A perfect, and hitherto undescribed, chantry-altar, exists in the north chapel of the church at Clapton in Gordano, near Bristol. *ECCLÉSIOLOGIST Journal*, iii, 6.

In England, altars seem to have been generally taken down about the year 1550, in consequence of decisions of the council of state upon the injunction of 1 Edw. VI, 1547. They were again set up in the beginning of the reign of Queen Mary; and finally removed in the second year of Queen Elizabeth, 1559. COMMUNION TABLE.

2. ALTAR (late Latin, *altare mobile, portatile, or itinerarium*) is also the name given to a small portable table or slab, of wood, stone, or metal, which was called the UPPER-ALTAR, or SUPER-ALTARY.

2. ALTAR OF CREDENCE (It. *credenza*; Sp. *credénzia*) is an expression used by GLAIRE and WALSH, *Dict. s. v. AUTEL*, for the table of prothesis, or CREDENCE TABLE.

ALTAR-PIECE. The sculptural or pictorial decoration placed above and behind the altar, and confined, if at all, by little more than an ornamental frame. This is called in France the *contre retable*; and the altar, if isolated, may be without any such addition. When the altar is attached to a wall, the frame is generally expanded into an architectural frontispiece, called in France the *retable*. REREDOS. Amongst the immense number of *retable* altar-pieces upon the continent, it would be difficult to find specimens which are not alike offensive to the dignity of architecture, and to the situation in which they are placed. A profusion of precious marbles, and in some cases the more valuable metals gold and silver, have been introduced to enhance the effect, if not the beauty, of the mass.

Among the most interesting altar-pieces in Italy, is that in the cathedral at Modena, made of terra-cotta, in the style of the *renaissance*, with abundance of curious statuettes; but the twelve altars in the nave and transepts of the cathedral at Pisa, of which the design is attributed to M. A. Buonarroti, and the execution correctly assigned to Stagi di Pietra Santa, deserve particular attention.

ALTAR-RAIL. A fence, about three feet in height, enclosing the altar or communion table. It is fixed in English churches, in compliance with the seventh canon of London, 1640: this is the last on the subject, and declares that the holy tables should stand where the altars did, and be railed in. The *ECCLÉSIOLOGIST Journal*, i, 59, observes that altar-rails are not innovations strictly speaking (ALTAR-SCREEN), having been in use, though not commonly employed before the Reformation, according to the testimony of three authors, who wrote at the time when the controversy respecting them was at its height; the first, favourable to them; the second, neutral; and the third, opposed to them; viz. POKKLINGTON, *Altare Christianum*, 4to. Lond. 1637; UDALL, *Communion Comeliness*, 4to. Lond. 1641; and CHANCEY, *His Retraction*, 4to. Lond. 1641. On the continent, at the present time, a linen cloth held up before the communicants, answers the purpose of rails.

ALTAR-SCREEN. A fence, more than three or four feet in height, which, according to PUGIN, *Treatise on Chancels*, 4to. Lond. 1851, should surround or protect every altar. He gives illustrations of such enclosures from CAMPINI, FONTANA, PISTOLESI, and WILLIS, in old S. Peter's at Rome; from a picture by Pinturicchio at Sienna, and from a picture of the cathedral at Antwerp; and cites, from the Constitutions of S. Carlo Borromeo, a section which prescribes that the high

altar should be so placed, as that there shall be between the lowest step to it and the screenwork by which it is, or is to be, fenced, a space of twelve feet, and even more, if possible. The church of S. Michele at Florence, is an interesting example of a detached altar, surrounded by a railing composed of marble and bronze, divided into panels of open tracery, which supports a crest with prickets for tapers, and furnished at each angle with a group of columns, carrying a figure of an angel bearing a metal candlestick. EUSEBIUS mentions a wooden fence round the altar in a church built by the Bishop Paulinus at Tyre; and the Emperor Theodosius specifies the "sacrosanctum altare cancellis clausum." Of late years there has been some use made of the term ALTAR-SCREEN for the REREDOS.

ALTAR-TOMB. A modern term, introduced to express that a monument is of the shape and general size of an altar, as that word was understood at the end of the eighteenth century, viz. a double cube about 3 ft. 6 ins. high: an older term appears to have been HIGH TOMB, and is ascribed in the GLOSSARY to LELAND.

ALTDORFER or ALTORFER (ALBRECHT) is said by SANDRART and FUSLI to have been a native of Altorf, in the canton of Uri: but HEINEKEN, *Dict. des Artistes*, s. v., quotes M. Wild, a senator of Ratisbon, as his guide in stating that the birthplace was Altdorf, near Landshut in Bavaria; the date of his birth is made 1488 by some authorities: it is assumed on all sides that he was a pupil of Albert Durer, and that he was an engraver and painter, as well as an architect. He is mentioned in the list of burgesses of Ratisbon in 1511; and he raised himself to the rank of member of the inner senate, and of architect to the city, which he adorned with many handsome edifices. The dates of his death are variously given, 1533 (HEINEKEN) and 1578.

AL TEDESCO, see TEDESQUE.

ALTENBURG. The capital of the duchy of Saxe-Altenburg. It is a walled city, and irregularly built upon several hills, but having some fine streets. There are several handsome buildings in the city, which contains seven or eight churches; a *gymnasium*; a library; three hospitals, and other charities; a convent for noble Protestant ladies; the government and other offices for the circle of the same name; house of correction; theatre; and several literary and scientific institutions. The castle or palace, of which the older portion dates from the 13th, and the modern addition from the 17th, century, stands on a hill of porphyry.

ALTERATIONS. The term applied to works designed in consequence of anything executed not being suitable or agreeable to the purposes or tastes of its possessor: whether the external or internal appearance is to be slightly modified or considerably changed, the variations from the existent work receive this appellation. The policy of making alterations by a tenant, depends upon the value of the tenancy, and is so frequently not considered, especially in large towns, as to have become of late years the subject of an agitation for fresh legislation.

ARCHITECTURE ALTERÉE is a term employed by BLONDEL and other French writers to denote the appearance of a composition, in which such liberties had been taken as omissions of any of the parts usually considered as essential to an order, or as mutilations of portions without legitimate excuse, when a change of plan, elevation, etc., might have obviated the difficulty.

ALTERNATION (It. *alternazione*; Sp. *alternacion*; Fr. *alternation*; Ger. *abwechslung*). That reciprocal succession of things which gives life to an architectural design. The eye being unable to convey more than one notion at a time to the mind (which has the power of even greater rapidity than the almost inconceivable velocity with which the eye can be turned from one point to another), the mind receives only successive reports from the sense of sight. Thus, in looking at the range of dentils in a cornice, the mind has to recognize, not at once, but in a rapid train of sensations, the alternation of light and shade, of mass and void, of form and colour; and the self-con-

sciousness of this action is certainly a pleasure, for it has been sought in every architecture of every country. The whole work of SIR WILLIAM CHAMBERS, on the *Decorative Part of Civil Architecture*, teems with sound observations on such alternations as windows and niches, windows and doors, varied forms of windows, columns and intercolumns, balustrades, pointed and segmental pediments, ornaments in mouldings and friezes, etc. These alternations are not difficult to obtain, and are therefore of less importance to the designer than the artistic balance of form and of chiar'oscuro with reflected lights.

ALTITUDE. When this term is used with regard to architectural objects, it may be considered to signify their height proportioned to their distance from the eye of the spectator. If ornament be placed within the distance at which the eye begins not to recognize the proportions of the parts, the work may be considered correct; but if it be placed beyond that limit, it will appear confused, and, as it were, unworthy of its position. Ornaments, such as balustrades, vases, etc., have been regulated by a proportional scale of altitude to the human figure, and since the commencement of the present century, French and Italian artists have endeavoured to employ a scale, which gives for heights under 25 feet, three quarters of an inch in altitude to the figure or foliage for every foot of height from the ground, with about '006 in addition for every foot above that height for exterior work; a little less is allowed for interior work; thus in interior decorations, such as the cornices of rooms, assuming the wall to be 30 feet in height, the height of a human figure in a frieze would not exceed 1 ft. 11 in.: this dimension is deducted from the total height of the wall after the calculation is made, whereas in exterior work the altitude is added to the actual height of the work. W.H.

According to such a scale, a height of

25 feet x .750)	
26 " " .736)	
27 " " .762)	and divided by 12, gives an
28 " " .768)	altitude in feet and inches.
29 " " .774)	
30 " " .780)	

ALTONA or ALTENA. The second city in the kingdom of Denmark, a rank which it obtained in 1664, although it was merely a village in 1640. It was burnt by the Swedes in 1713. It has six churches, one of which, the Hofkirche (Evangelical Lutheran), with two towers, is considered the handsomest in the duchy of Holstein; a college founded by Christian VII; a *gymnasium*; an infirmary; an orphan asylum; a theatre; a mint; a public library; and two synagogues. The *Allée, Palmalle, or Pallmall*, as it is sometimes called, consists of a long and broad road between two rows of lime trees, with another road on each side, which form sheltered avenues, with footways to the houses on each side.

ALTORFER, see ALTDORFER (ALBRECHT).

ALTO RILIEVO. A term applied to that amount of projection from the background, which is given to a figure or to ornament when the work stands out more than one half of what it would, if the entire object were applied to the ground. So that in general the subject appears but slightly attached to the background, and in parts is often entirely free. **RILIEVO.**

ALUM (It. *allume*; Sp. *alumbre*; Fr. *alun*; Ger. *alaun*). The salt commonly known by this name is a double sulphate of alumina and potassa; and the greater part of that used in commerce is prepared artificially from minerals called alum ores. The first regular alum works that were established were at Roccha or Edessa in Syria, from which source Europe was supplied until the fifteenth century, whence its common name *roche alum*. The ores consist of sulphur combined with iron in various proportions, alumina, potash, and bituminous matter: by mere exposure to the atmosphere the ore undergoes spontaneous decomposition; the sulphur, taking oxygen from the atmosphere, is converted into sulphuric acid; this combining with the alumina and potash, forms alum; which effloresces on the surfaces: calcination, at a low heat, expedites the process.

CHAPTAL and others have obtained alum directly from its component parts by subjecting clay to the action of sulphuric acid. Alum is decomposed by the alkalis and alkaline earths, which precipitate the alumina; muriate of lime, acetate of lead, etc., effect a double decomposition. SODA ALUM is sulphate of soda mixed with sulphate of alumina: AMMONIA ALUM is sulphate of ammonia mixed with sulphate of alum; when soda is added in excess it is decomposed, and the ammonia is evolved. Alum is mixed with plaster of Paris to give it a harder setting quality, as in Keene's cement, but effloresces; and is added to paste, by paperhangers, for the purpose of neutralizing any grease; it has, however, the disagreeable effect of destroying several of the colours used in paperstaining. 48, 88.

ALUMINA (Fr. *alumine*; Ger. *alauerde*), the base of alum. It is also called EARTH OF ALUM, ARGIL, or ARGILLACEOUS EARTH; and is dispersed over the globe in the shape of clay, loam, etc., which are composed of alumina, combined with water, and mixed with silica and other substances. It enters largely into the composition of slate and other minerals, while the sapphire and the ruby are almost entirely composed of it. It is insoluble in water, for which it has a strong affinity, shown by the high degree of heat which is necessary to decompose the hydrate: under a blowpipe it fuses into a transparent glass. It unites readily with most of the acids except the carbonic. 48.

ALUMINUM. The metallic base of alumina. It dissolves in a weak solution of caustic potash, with the evolution of hydrogen; the same takes place in ammonia; when heated it dissolves readily in concentrated sulphuric acid. 48.

ALURE, ALUR, ALURA, ALORYNG, ALURING, VALURYNG, AILURE, ALOURE, ALOURDE, ALURDE, ALURY, ALLIENY. An old English term corresponding with the late Latin words ALORIUM and ALORIUM, and generally designating a passage; an ALLEY in a church or garden, or a covered way in a street. It was even used to express the waterway and footway on a roof, now called a gutter: WILLIS, *Architectural Nomenclature*, 4to. 1844, has also quoted with approbation its application to the parapet only of a gutter, and other passages to the same effect might be cited. ALLEY.

ALUSHTA. A town on the south coast of the Crimea in Russia, is situated on a detached schistous hill, which is crowned by a castle repaired in the sixth century by order of Justinian. The town contains the remains of several Greek churches. The houses are half sunk in the ground, the walls are made of roughly hewn stones cemented by a sort of fatty earth, and they are finished with a flat roof, which serves as a terrace walk, or as the platform from which the next house on the ascent is entered. MONTPEREUX, *Voyage autour du Caucase*.

ALVARADO, see SANCHEZ DE ALVARADO (JUAN).

ALVAREZ (BALDASAR) in 1598 commenced the construction of the great monastery of S. Benito at Lisbon. 66.

ALVAREZ (JUAN) undertook, on the death of Juan de Ezquerria in 1574, to carry out that architect's design for the exterior of the church of Malpartida, which is considered to be one of the finest edifices in the province of Estramadura in Spain. Alvarez, however, himself designed the front, which is executed of the Corinthian order in two stories; and he also has the credit of the handsome Corinthian apse of the choir. In 1577 he finished the celebrated staircase of the monastery of S. Vicente, belonging to the Preaching Friars in the city of Plasencia in the same province. Tradition attributes to him the highly praised sacristies of the same monastery, as well as the continuation of the parish church at Miajadas in the same province, which had been commenced by Ezquerria: the south front, with four Doric columns, is doubtless the work which Alvarez designed and completed in 1603. 66.

ALVAR-GARCIA, see GARCIA (ALVAR).

ALVAR-GOMEZ, see GOMEZ (ALVAR).

ALVEARIUM or ALVEARY. A Latin term, sometimes applied to a beehive, but properly used for a collection of beehives or APIARY.

ARCH. PUB. SOC.

ALVEUS. A bathing place in the pavement of the caldarium of the Roman baths, constructed at the extremity opposite to that which contained the *labrum* (VITRUVIUS, v, 10), and furnished with a step, *gradus*, at bottom, which formed a seat in the water for the bather when not swimming, his back resting against a parapet wall, *pluteus*, from which two steps on the outside sometimes led down to the floor of the room. VITRUVIUS calculates one foot in width for the *gradus*, another for the *pluteus* or *pulcrinus*, and five for the ALVUS, as shown in fig. 1, plate 2, BATHS, etc. 51.

ALVIZ (JUAN) designed and built, 1523-1538, the church of S. Pablo at Cuenca in Spain. 66.

ALVIZ (PEDRO), brother of the preceding, designed and built, 1523-1538, the Dominican monastery of S. Pablo at Cuenca in Spain. 66.

ALVUS. The space left vacant for a walk between the SCHOLA and each ALVEUS in the caldarium of Roman baths. 51.

ALYO (. . .) was one of the leading architects at Vienna in 1780. 26.

ALZAGA (PEDRO DE) designed the Gothic tower of the parish church at Guetaria in the province of Guipuzcoa in Spain. This work was commenced in 1526, and carried on steadily until 1597, and from time to time until 1755, when its inclination to one side put an end to further operations. 66.

ALZOLARAZ (JUAN DE), of Guipuzcoa in Spain, in conjunction with Domingo de Estala, executed in 1564 the land gate of the castle of S. Sebastian in that province. 66.

ALZUA (JUAN DE) was a pupil of Pascual Iturriza. 66.

AMAASA. A word explained in some dictionaries as "pieces of glass used in enamelling;" it seems to be a variation of *mafsass*, an Arabic term equivalent, (according to MACCARY as translated by DE GAYANGOS, i. 93, 496, 498,) to *fascyfasa*, *fscfysa*, or *fscfosis*, (also *fasyypasā*), which WYATT, *Specimens of Geometrical Mosaic*, fol., Lond., 1848, quoting HENDRIE and DIDRON, assumes to be clearly identified with the *ψήφους χρυσόις* (golden mosaics) of the Byzantine OPUS MUSIVUM, or glass mosaic.

AMADA. At Hassáia, not far from Derr, the capital of Nubia, is a small, but elegant temple called Amada (Fr. and Ger. *Ammadon*), in excellent preservation, consisting of a portico, transverse corridor, and five inner chambers, one of which was the adytum. The whole extent of the ancient building, which was converted into a church by the early Christians, is about 71 feet 6 ins. by 32 feet 2 ins. The mode of lighting, by means of small apertures in the ceiling, is shown by GAU, *Antiquités*, fol., Paris, 1822, pl. 48, 49, who states an opinion that the four columns at the end of the portico (which otherwise is composed of square pillars) were additions; they have twenty-four faces, a round base, and a square abacus or PLINTHOS. The names of the monarchs, Osirtasen III, Thothmos III, his son Amenoph II, and Thothmos IV, are all found in these remains. 28.

AMADEO, see HOMODEUS, (GIO. ANT.)

AMAKHUKHI, in the Ionian Islands; see AMAXICHI.

AMALFI. A seaport in the province of Principato Citra, in the kingdom of Naples. It is extremely picturesque from its position on the gulf of Salerno, which is confined by mountainous rocks, on the declivities of which the city is built. On the *marina*, or strand, some arches are shown as the remains of the once famous arsenal, and at the extremity of the town a massive round tower is all that remains of the fortifications of one of the most prosperous and powerful mediæval republics of Southern Italy. The archiepiscopal cathedral, dedicated to S. Andrea Apostolo, whose body was deposited there in 1208, is still a beautiful structure, though injured in some portions by modern alterations: in style it resembles most of the Sicilian and South Italian churches of the eleventh and twelfth centuries, being a mixture of Romanesque and Saracenic art. It is approached by a lofty flight of steps, on the summit of which is an atrium or porch of pointed arches extending along the whole front of

the church. The bronze doors to the principal entrance were the work of Byzantine artists in the early part of the eleventh century: they served as the model for those at Monte Casino. The campanile is a fine example of the style; square at the base, it rises in four stories, the third having triple semicircular headed windows in an enclosing arch; the fourth is circular, surmounted by a cupola, and having four circular engaged turrets; the whole being adorned with inlaid Saracenic work; it was built in 1276. The cloisters are of the same period, having lofty and intersecting pointed arches carried on small coupled columns. The interior of the cathedral, consisting of a nave and three aisles (a fourth aisle, which existed, has disappeared), although modernised at the commencement of the last century, preserves the remains of much of its ancient arrangements: the marble and mosaic pulpit, of the twelfth century, somewhat resembling that at Salerno, has been repaired to as great extent with modern work. The cloisters of the monastery of S. Antonio are of the thirteenth century, and in good condition. The city formerly contained the original hospital of S. John, which gave its name to the military order of S. John of Jerusalem, or Knights Hospitalers.

J. M. L.

AMALGAM (Ger. *quickbrei*). The technical term for any alloy into which mercury enters. Amalgamation is practised either to render a metal fit to be spread, as for gold-leaf, or to reduce it to powder; and, when requiring an artificial operation, consists of two distinct operations, viz. triturating without heat, and fusing before adding the mercury.

AMAN. A native wood of Tavoy, East Indies, forming a small tree, used for building. It is probably the same as **ANAN**.

71.

AMAN, (JOHANN) born at S. Blasien, in Baden, 19 May, 1765, was first known as a glass painter. His architectural career commenced in 1791, when the Austrian "Bau-direction" in Freyburg licensed him to build a parsonage-house and finish a new church. In 1793, he went to Rome, and having studied the architectural antiquities for two years, he settled at Vienna in 1795, and erected, in 1797, in the Kohl Markt, a building near the Rothen-thurm for the reception of the Mueller collection, which recommended him to the patronage of the emperor, who employed him upon the interior of the chapel of the palace in 1799 and 1800; in 1799 he designed a theatre, which is said to have been spoilt by the deviations made from his designs. He was next occupied upon the Hohe Markt, the Dorothea Hof, and other improvements in the city. On the death of Prosche, in 1803, he was appointed to succeed him as Hof-architekt; in virtue of which position he erected, 1806-1812, the new theatre at Pesth, to hold 3,000 persons; and was engaged from 1810 to 1813, in directing the repairs of the cathedral church of S. Stephen at Vienna; and the restorations and embellishments of the imperial villa at Schoenbrunn, where he was again occupied, in 1819 and 1820, in putting it into the condition in which it remained until 1843: the conservatories in the private gardens there were also begun by him. Besides these works, and others of less importance, Aman was occupied in the superintendence of the illuminations during the sitting of the congress in 1815, and in the designs for a new court theatre (1817), and for a veterinary hospital, etc. (1819), all at Vienna. He made (1816) a plan of the water-supply to that city, from 1702 to 1806, and devoted the remainder of his life to making drawings and reports upon the ancient extent and gradual growth of Vienna, in continuation of a model which had been ordered from him in 1814. He died 28 November, 1834.

68.

AMARAPURA or **AMRAPOORA.** A city in Birmah, founded in 1783, and made the capital of that empire to the prejudice of Ava, to which the government returned in 1819. It contains a great number of temples and pagodas, the gilded roofs of which give the city a splendid appearance from the environs; but the city itself consists only of a fortress with suburbs extending about four miles along the river Irawaddy: these suburbs are composed of houses generally made of wood

with tiled roofs, but some are of bamboos and mats covered with shingle, or thatch: the few dwellings of brick belong chiefly to the royal family; pots of water are ranged on the ridges of the roofs in case of fire, yet in spite of all precautions, nearly the whole city was burnt by accident in 1810. The fortress is square in plan, each side being about 7,200 feet long (CRAWFORD, *Journal of an Embassy, etc., to the Court of Java*, 8vo., Lond., 1834), with walls 20 feet high, faced with brick. Each angle has a large square bastion, and between these, at regular intervals of 200 feet, on each side of the fortress, are eleven smaller bastions, a principal and two smaller gates. The moat is 50 feet wide, and 15 feet deep. The north-west angle contains the royal library, the books of which are kept in about a hundred wooden chests.

14. 50.

AMASAJABEL (JUAN DE) is mentioned as having been appointed, in 1563, to succeed Pascual de Iturriza in the completion of the church of Sta. Marina de Oxirondo, in Vergara, which was finished a few months before his death in 1584.

66.

AMASIA or **AMASIEH** (the ancient **AMASSEIA** or **AMASIA**). A town in Anatolia, the seat of an Armenian archbishopric. The narrow and tortuous streets, lined with tiled houses, contain many Saracenic buildings either in ruins or used as mosques: the front wall of an old medresseh is built of antique cornices, friezes, architraves and inscribed stones; and one large mosque with two lofty minarets was built of stone by the Sultan Bay-azid; the dome is covered with lead, and gilt. There are two wooden, and three stone bridges, one of which is supposed to be a Roman work. A portion of the walls, two towers of beautiful Hellenic construction; a subterranean passage 300 feet deep, with a well at the bottom; are the only remains of the ancient acropolis. Five excavations in the face, at about 100 feet above the base, of the rock on which the castle is built, together with the remains of their enclosure or peribolus are described as the tombs of the kings of Pontus by STRABO, who was born here.

AMASREH, AMASEREH or **AMASTRA** (the ancient **AMASTRIS**). A town in Anatolia, exhibiting a confused mass of Greek, Roman, Byzantine and Genoese remains.

50.

AMATITLAN or **AMITITAN.** A town in Guatemala in Central America. The houses have only a ground story, and are principally constructed of mud beaten hard with a wooden mallet in a wooden box, which is made of the thickness of the walls, and moved from place to place until the requisite height and length are obtained.

40.

AMATRICE (COLA DELL') was a painter and sculptor as well as an architect. He established himself at Ascoli about the year 1500. In the architrave of the first order of the church of S. Bernardino (1525—1542) at Aquila, not far from Amatrice, in the kingdom of Naples, is the inscription "Cola Amatricius Architector instruxit."

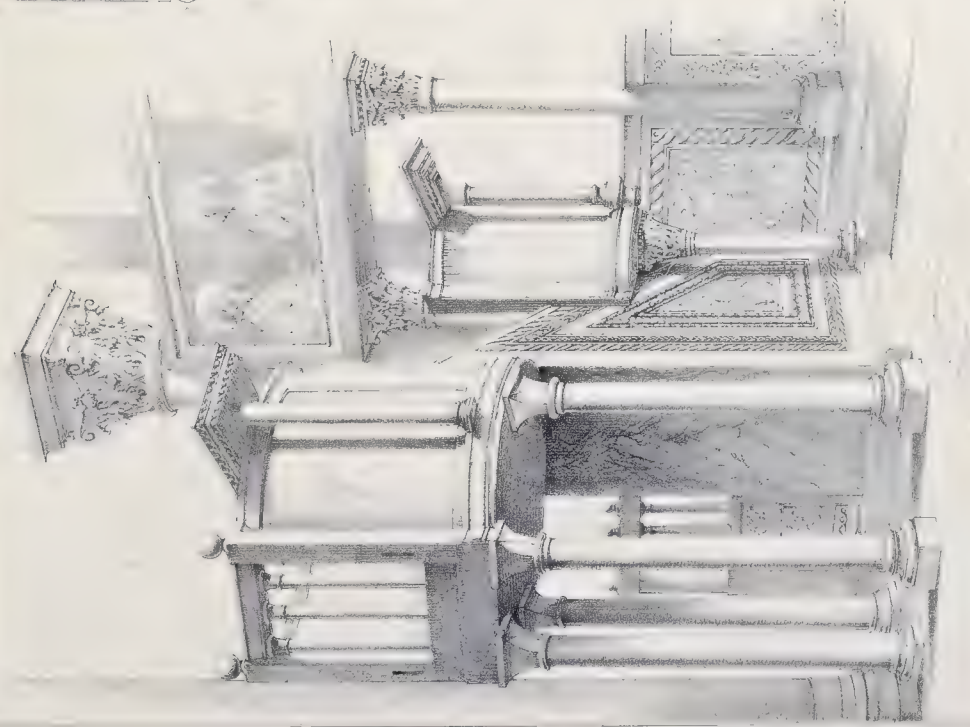
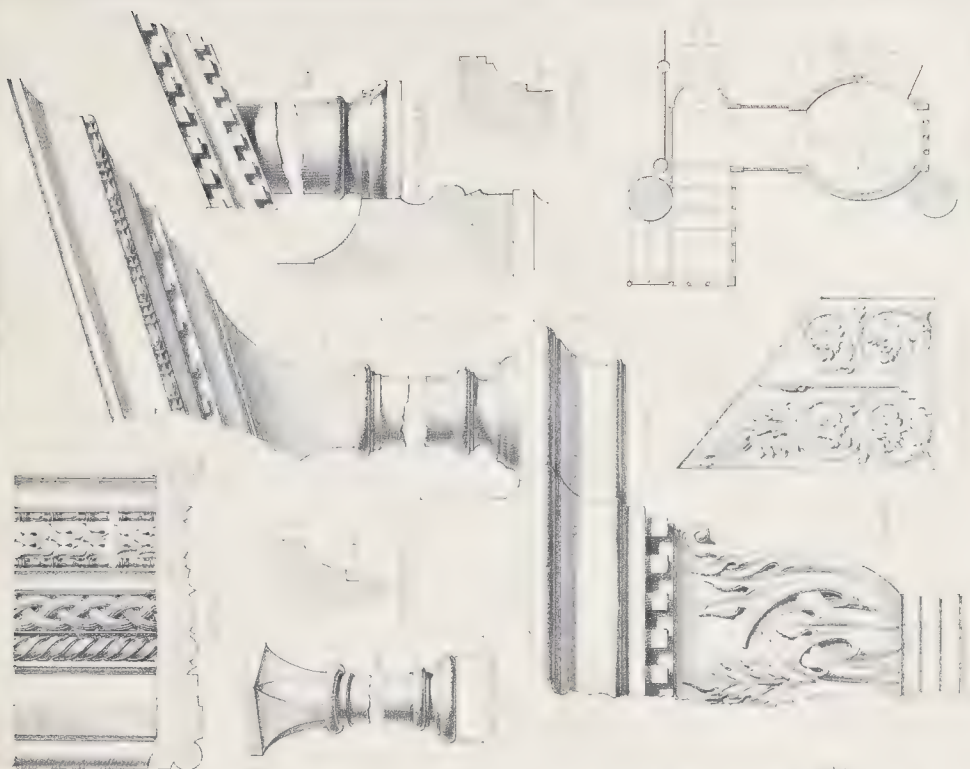
3. 62.

AMAXICHI or **AMAKHUKHI.** The capital of Sta. Maura, one of the Ionian Islands, and the seat of a Greek bishop. The houses are chiefly of wood, but there are several churches of stone; a castle, with a road to the town formed upon three hundred arches which remain of an old aqueduct; a governor's house, and the remains of the ancient **LEUCAS**.

28.

AMBER, in Hindostan, see **AMBHIER**.

AMBHIER, or **AMBHEER**, or **AMBER.** The former capital of the Ameers of Jeypoor in Ajmeer (Hindostan), which, on the occasion of the Rajah Jeysing choosing a residence five miles distant, was neglected, and a new city named Jeypoor sprang up, and gave its name to this district of Rajpootana. Ambhier is beautifully situated on the banks of a small lake surrounded by steep mountains; it is now in ruins and nearly depopulated, but its former grandeur is shown by its lofty pagodas, a large reservoir, and numerous arches and pavilions, through which a narrow street leads to a steep ascent paved with granite, and giving access through several gateways with pointed arches to the palace. The stone and marble sculpture, and other ornaments of the interior of this edifice, are only



TORCHILLO



surpassed by those of the Taj Mahal at Agra. Some of the fountains from the palace have been brought to Europe, and are admired as exquisite specimens of that style of decoration, combined with gigantic foliage and grotesque faces. The balconies, terraces, and gardens are still beautiful, although in part dismantled; some of the apartments in the palace were lighted with coloured or stained glass, and coloured glass was introduced in the tessellated pavements of the halls; the effect of it among the white marble is gaudy. The palace and the castle are now used as state prisons. W. H.

AMBIANIS, in France, the modern AMIENS.

AMBITUS. The Latin term for a space round every tomb, defined in the inscriptions by the words *in fronte pedes . . . in agro pedes . . .* This space was considered or intended to be considered as sacred; and inscriptions have been found invoking maledictions on those who disturbed or defiled it. When the term is employed in descriptions of COLUMBARIA or HYPOGEA, it must be understood to imply the space left in the niche or wall after the reception of an urn or coffin. The word also expresses the vacant ground left round the ancient Roman houses, being according to FESTUS, 2 ft. 6 in., or according to other writers, as much as the projection of the cornice of a common wall would cover. EUSEBIUS and the Emperor Theodosius use the term for the passage round the choir.

AMBO, in the plural AMBONES (Gr. ἀμβων; It. *ambone*; Fr. *ambon*, *lettrier*, *pupitre*, *jubé*; Ger. *lesepult*); also called PYRGOS, AUDITORIUM, ANAGOGIUM, ANALOGIUM, DICTORIUM, GRADUS, LECTORIUM, LECTRICIUM. This word originally implied a raised pulpit. It became the technical term for a reading, singing, and preaching desk, which was originally situated in the centre of the chord of the BEMA (where it became the origin of the CHOIR), and afterwards, as in some Greek churches, on the north or south side; in large churches there were two, one on each side. As the churches grew larger, and if there was only one ambo, it was situated in the middle of one side of the choir; sometimes two were so placed, opposite to each other; and at last, as the size of the churches grew still larger, the proper position was at the west end of the choir immediately within the entrance. In the upper part of the single ambo there were usually two steps, from the higher of which the Gospel was read, and from the lower the Epistle; after the reading of the Epistle, the chanter mounted the ambo with his *antiphonarium* and chanted the respond, which is still called the *graduale* in the Roman ritual, on account of the steps which he had to ascend. Sometimes even there was a third for the recitation of the Psalms and other portions of the Old Testament. BATISSIER, *Histoire de l'Art Monumental*, 8vo., Paris, 1845, adds, that at a later period the ambo was transformed into a construction separating the sanctuary from the nave and forming a chancel; and at that time it had either a pulpit between two lateral doors, or two pulpits with a door between entering to the nave. The GLOSSARY gives a quotation in which four ambones are mentioned as being placed in one ANAGOGIUM. CIAMPINI states that the ambo fell into disuse about the year 1309. The last ambo erected in Rome is supposed to have been that in the church of S. Pancrazio, on which the date 1249 is still visible. MYLNE in *Weale's Quarterly Papers on Architecture*, 4to, Lond., 1845, and GAILHABAUD, *Architecture*, etc., 4to., 1853, vol. ii, largely illustrate the arrangements in S. Clemente at Rome, one of the most perfect of the basilicas now remaining; and (always remembering that as the altar looks eastward, *i. e.*, is at the west end of the church, all arrangements are exactly reversed as to the cardinal points) give a very good idea of the design of the ancient ambones when two were in use. That for the Epistle, on the right hand side of the spectator looking to the altar, is a square pulpit, with a lectern standing therein, and is ascended by a flight of steps from the east, with a desk facing the altar. On the landing of the first two steps there is another small lectern looking towards the porch, whence the response was chanted and the

lectures, etc., of the clergy were delivered. That for the Gospel, on the left hand side of the spectator looking toward the altar, is a pulpit rather octagonal in plan, is ascended by two flights of steps, one from the east the other from the west, is higher than that for the epistle, and was also used for reading the diptychs containing the lists of persons alive or dead for whom prayers were to be offered; at times the bishops also preached from it; and from it episcopal ordinances, anathemas, excommunications, reconciliations, recitals of miracles, and other ecclesiastical proclamations, were delivered to the people. East of the ambo, *i. e.* towards the nave, a spiral Composite column stands on one of the piers of the screen of the presbytery, altogether twelve feet high, to support a paschal candle. Two other ambones (A.D. 1008) are mentioned as remaining in their respective places in the cathedral at Torcello. At Rome an ambo on each side of the choir is to be seen in the church of Sta. Maria in Cosmedin (of the twelfth century); the example in the basilica of S. Lorenzo fuori le mure, illustrated by GAILHABAUD, vol. ii, is ornamented with porphyry and glass mosaics. D'AGINCOURT, *Histoire*, etc. (painting, pl. 55), fol., Lond., 1847, gives an illustration from a painting in a manuscript in the Barberini library, representing a preacher in an ambo resembling closely that at S. Lorenzo; and as this is the only form to be found in the most ancient churches at Rome, it may be considered as the original Latin type, discontinued after the thirteenth century. There is a fine example in the church of Sta. Maria in Araceli on the Capitol, given by WYATT, *Specimens*, etc., fol., Lond., 1848, pl. 16; there is another instance at Corneto, dated 1208; and in the cathedral church of S. Pantaleone at Ravenna near Amalfi is an example, similar to the early Roman type; it is interesting as bearing the story of Jonah in mosaic, and from the inscription recording its donor and date, viz. Costantino Rogadeo, the second bishop of that see, 1130. It is enriched with glass mosaic and opus Alexandrinum; it is called of the sixth century, and illustrated by D'AGINCOURT (*Architecture*, pl. 28). Cardinal Baronius, when restoring the basilica of SS. Nereo ed Achilleo in 1595, "arranged in the ancient manner the ambo with the presbytery, confessional, and ambones for reading": for want of a parallel passage the first "ambo" might be supposed a mistake for "choir", but if it be admitted that the ambo was the original choir, it will be easily understood that the ambo must then have had low sides, with wooden seats, like those in the chantries of some parish churches, and finished with lattice work, which would be covered with a veil of hangings, etc. Such an ambo was not removed from the church of S. Paolo in via Ostiense at Rome until 1585-1590. At all events, the ambones of Cardinal Baronius are marble desks enriched with sculpture, and fixed on the entablature of a screen about seven feet high, likewise of marble and panelled, behind which a flight of steps on each side leads to an elevated platform, on which the steps and ciborium of the altar are placed, and from which level the subdeacon and deacon sang the epistle and gospel. Probably the most perfect specimen of the late ambo is in the chapel of Sta. Maria dell' Arena at Padua (1303), where the stalls of the choir return partly on each side of the entrance, and are backed by stone walls about four feet high on the inside, and seven feet on the outside; the space between them is approached by steps, and forms a platform or ambo for the chanters, for whose use an iron and a marble desk, both of the fourteenth century, still remain (see illustrations, PULPIT). These form a screen to the choir, and serve as dossels or recedes to two altars which are placed against them. PUGIN, *Treatise on Chancels*, 4to, London, 1851, adds that "these pulpits were also used for chanting the lessons of the Divine office, and from the reader asking a blessing before commencing with Jube Domine Benedicite, they were commonly called 'jubés', which name was retained when those pulpits were exalted into a lofty gallery reaching across the choir;" which sometimes held an altar, as that of S. Jean at Lyons, and in the church of S. Maurice at Vienne. JUBÉ. PULPIT. ROODLOFT. 2.

LENOIR, *Mémoires du comité des arts*, etc., Architecture, p. 113; THIERS, *Dissertations liturgiques*; HOPE, *Hist. Essay on Architecture*, 8vo., 1840, pl. 26; the works of BEVEREGIUS, SARNELLI, and VOIGT, cited in the article BASILICA.

AMBOINA or AMBOYNA. The capital of the island of the same name, which forms one of the Molucca or Spice Islands. It is clean, neat, and regularly laid out, with straight, wide, but unpaved streets, intersected by numerous canals planted on each side with shrubberies, and crossed by the little bridges common in Holland. It contains a governor's palace, a townhouse two stories high, two Protestant churches, an orphan hospital, theatre, and a large covered market place. The houses, which are erected after the Dutch fashion, are only one story high, built of quarterings planked on both sides, externally horizontal and internally vertical; the spaces between the studs are sometimes, and the joints of the planking are always, filled in with clay. Although the island is so abundantly covered with trees and underwood, as to be celebrated for hard woods, such as Amboyna or *Kiabooka* (*PTEROSPERMUM indicum*) and Zebra (*OMPHALOBUM Lambertii*) wood, yet these being useful only in cabinet and fancy work, the inhabitants are forced to exchange them and spices for ash and pine timber, of which large quantities are imported from Java. A public garden with a menagerie, and a long esplanade extending with a double row of nutmeg trees in front of the houses between the town and Fort Victoria, are very agreeable features. W. H.

AMBRE, AMBRIE, old terms for AMERY.

AMBRICES. According to FESTUS, s. v. this was the Latin term for the *regulae*, laths or battens, placed on the rafters of a roof to carry the tiles.

AMBROGINI (FRA ANTONIO), who flourished about 1700, was born in the district of Diecimo in the territory of Lucca, and was engineer to the then Duke of Modena, and afterwards to the republic of Lucca; some authors say that he built the beautiful bridge of S. Pietro, over the Serchio, while others doubt his employment on that work. 87.

AMBROGIO DA CASALE, see CASALE (AMBROGIO DA).

AMBROGIO DA MELZO, see MELZO (AMBROGIO DA).

AMBROGIO MANIZIA, see MANIZIA (AMBROGIO).

AMBROGIO (PETROLI DI SAN) is mentioned by FRANCHETTI, *Storia*, etc., *del duomo di Milano*, 4to., 1821, in the list of architects of the *duomo* at Milan, under the date April 16, 1411.

AMBROSINI (ANDREA). There were two architects of this name who practised with considerable reputation at Bologna: the palazzo Bingi, formerly Odorici, in the Strada S. Stefano, and the chapel of S. Domenico, were built by one of them, probably by the earliest, who flourished at the beginning of the seventeenth century; the other lived a hundred years later, and erected the beautiful Dominican monastery of the S. Trinità, and the church of the convent of S. Pietro Martire. 28. 68.

AMBRY, AMBRIE, AMBRE, AMBREY, AUMERY, ALMERY, ALMARY, ALMARIUM, ALMARIOL, ALMARIOLUM, ARMARIUM, ARMARIOLUM (It. and Sp. *armario*; Fr. *armoire*; Ger. *brodschränk*). The old English term for a niche formed in a wall, i. e., a locker, or a cupboard framed upon it, by the side of an altar, to contain the utensils belonging thereto, with the host, the holy oil, and chrismatory. The term is also applied to the closets with shelves, buffets, or closets in which plate, relics, vestments, books and deeds, were kept; they were often of large size, and usually richly decorated. The GLOSSARY, s. v., mentions those at Selby in Yorkshire, and in the church of S. Pierre at Louvain. TAYLOR, NODIER, etc., *Voy. Pitt.* (Picardie, vol. iii) folio, Paris, 1835-43, give illustrations of two examples, one of the thirteenth and one of the fourteenth centuries, in the cathedral of Noyon. A fine example of the fifteenth century is the ambry executed in *intarsiatura* by Fra Damiano da Bergamo for the monastery of S. Dominico at Bologna. ALMARIOL. AUMBRY.

AMBUESA (JUAN DE), born at Rubielos in Aragon, distinguished himself at Valencia by his good taste and knowledge;

he erected the choir and staircase in the old church of the monastery of S. Miguel de los Reyes; and died 18th April, 1590, leaving a son, Pedro. His widow married Juan Cambra, who succeeded Ambuesa as architect to the church. 66.

AMBUESA (PEDRO), son of the preceding, born at Liria in Spain, commenced 7th June, 1623, the construction of the new church of the monastery of S. Miguel de los Reyes in Valencia; and died 20th November, 1632. He was succeeded, in 1633, by Martin de Orinda. 66.

AMBUESA or OMBUESA (PEDRO), is said to have examined the works of the church at Chelva in Valencia in the year 1638, and to have been employed thereon in 1645 and 1646. 66.

AMBULACRUM. The late Latin term for any promenade shaded by trees; but especially for the *PARVIS* in front of a basilica, being an esplanade open to the sky, surrounded with porticoes or planted with trees, and sometimes having a fountain in the centre. BATISSIER, *Histoire de l'Art Monumental*, 8vo., Paris, 1845, p. 280, 366. AMBULATIO. XYSTUM. XYSTUS.

AMBULATIO. The early Latin term for a promenade, whether open to the sky, or under cover. In the first case VITRUVIUS (v, 11, vi, 10) calls it *XYSTUM*, which may be translated a walk, path, or alley; and in the second case he terms it (v, 11) *XYSTUS*, which conveys the idea of a colonnade, corridor, or verandah: writers upon the ancient palaestrae have been considerably perplexed by the apparent similarity of the words in the present text of VITRUVIUS, and by the fact that PLINY in the description of his villa (the Tusca), clearly states that the *xystus* before the portico was cut into several forms and defined by box, while sloping from it there was an inclined *putrinus* or bank, on which the flowing acanthus mollis described the figures of animals fronting the opposite box-edging; all being surrounded by the *ambulatio* enclosed by trained and variously formed evergreens; and in the description of his villa (the Laurentina) he mentions the *xystus* fragrant with violets. But VITRUVIUS, v, 9-11, specifies that the *ambulationes* or alleys are to be laid out amongst trees; and (vii, 5) mentions that if decorated with paintings, the *ambulationes*, as corridors, galleries, or verandahs, on account of their length, required landscapes. The term is also applied to the space (Gr. *περιπαις*) between the wall of the cell of a temple and the columns of the peristyle (VITRUVIUS, v, 9), and in all cases it is rendered in English by the word *ambulatory*. PTEROMA.

AMBULATORY, or DEAMBULATORY, or AMBULATORIUM (It. *passaggio*; Sp. *ambulante*; Fr. *promenade*; Ger. *spaziergang*). A place to walk in, whether partially or totally covered or uncovered. The situation of the ambulatory may be external like the colonnade of a peripteral temple, or internal like a cloister, of which that forming the Campo Santo at Pisa is perhaps the most interesting example. In Naples, Venice, Bologna, Padua, and Modena, the houses constructed so as to allow of colonnades or arcades extending several feet from the front of the ground floor, and the Rows, as they are called at Chester, are remarkable illustrations of a passage in LYDGE, *The History, etc., of Troye*, fol. London, 1513, cap. 11.

"Deveyssed were longe large and wyde
In the frontell of euery stretes syde
Freshe alures
Vouted aboue lyke reynatoryes (alcooves?)
That called were deambulatoryes
Men to walke togylers twayne and twayne
To kepe them drye whan it dyde rayne."

W. H.

AMEL, written by Chapman, temp. James I, AMMEL (Fr. *émail*). An old term for the substance with which the variegated works are overlaid, which we call ENAMELLED. "When the materials of glass, being melted with calcined tin, have composed a mass undiaphanous and white, this white amel is, as it were, the basis of all those fine concretes that goldsmiths and several artificers employ in the curious art of enamelling."

BOYLE, *Experiments, etc., touching Colours*, 8vo., Lond., 1674, p. 358.

AMELIA or AMERIA. A city in the province of Spoleto, in the Papal States. It contains a cathedral dedicated to SS. Secundus and Olympiada, three churches, and some convents. Remains of the ancient walls of the city, constructed in the polygonal manner, are still extant. 75.

AMELIUS was actively engaged (1215-1221) in carrying out the rebuilding of the church of the monastery of Notre Dame at Dunes, in Flanders, of which he was the eighth abbot. SANDERUS, *Flandria illustrata*, etc., Cologne, 1644, i, 249.

AMELIUS (JOHANN) was employed from 1422 in the construction of the cathedral at Antwerp. 68.

AMENDOHEIRA. A native word of Brazil, used for furniture. 71.

AMENOPHÆUM, see THEBES.

AMERIMNUM EBENUS, or Cocus wood, also called green EBONY, a native of the West Indies, is used for turnery, etc. 71.

AMETHYST (It. and Sp. *amatista*; Fr. *améthyste*; Ger. *amethyst*). A precious stone, of which the oriental species is purplish violet in colour, extremely rare, and much more hard, heavy, and susceptible of a fine polish, than the occidental, which is employed in the Florentine mosaic work, and is only a variety of rock crystal consisting of two sorts, one being violet, rather dusky in colour, while the other, brought from Carthage, is purplish violet. w. h.

AMIANTIUS, is commemorated in an inscription of the date 3 B.C., given in REINESIUS, *Syntagma Inscr. Ant.*, fol., Lips., 1682, v, p. 597, Amianthus Architect. Nicanorian.

AMIENS (the ancient SAMAROBRIA or SOMAROBRIA and AMBIANIS). A city of the department of the Somme, formerly the capital of Picardy, in France. The city is divided into the lower and upper towns, and is traversed by the river Somme; the lower town was called by Louis XI his "little Venice", on account of the eleven canals into which the river is divided, and the numerous bridges across them; the streets are narrow, and the houses are old though not ancient: the upper town has wide and regular streets and *places*, lined with houses generally of two stories in height. The cathedral dedicated to the Virgin, is a most magnificent building; the first stone was laid in 1220, Robert de Luzarches being the architect; Thomas de Cormont and Renauld de Cormont are said to have been engaged in 1236, and the building was finished in 1288. The style is *ogival primitif*, but the west front appears not to have been completed until nearly a century later; and the upper parts of its two towers (after 1401) are described by BOURASSE, *Cathédrales de la France*, 8vo., Tours, 1843, as being in the style *ogival tertiaire*, while the light and airy central spire, 422 feet in height, is of the *renaissance* period, being finished May 22, 1533. The nave, the loftiest in France, and the most celebrated portion, is about 228 feet long, 39 feet 9 ins. wide between the piers, or including the four aisles, 150 feet; and 140 feet high; some of the forty-four detached columns are remarkable for giving a ringing sound when struck. The transept is 194 feet long and 36 feet 6 ins. wide between the piers. The choir is 135 feet long; the total length is 442 feet 3 ins. The broad and lofty windows, ranged in two stories, are so close that scarcely any wall obstructs the light. The three great rose windows, which still preserve their coloured glass, and as many magnificent porches, attract general admiration. The polygonal eastern apse is a feature nowhere else exhibited on so grand a scale. The triforium is glazed and gives great light to the interior. The choir preserved its altar, sedilia, jubé, indeed all its magnificent ancient fittings, until bishop de la Motte modernized it in 1755, when the great jubé was removed, and eight stalls were cut away to widen the choir gates; the remainder of these matchless works were only suffered to remain on account of the immense cost of replacing them by modern work. GAILHABAUD, *L'Architecture*, 4to., Paris, 1852, vol. iii; JOURDAIN ET DUVAL, *Les stalles de la cathédrale d'Amiens* (extrait des Mémoires de la Société des Antiquaires de Picardie).

ARCH. PUB. SOC.

A general view of the city, with a plan, an elevation, and two geometrical sections of the cathedral, views of that building from several points, the central clock tower, an exterior gallery, the flying buttresses, the nave, north transept, choir, organ, chapel of Notre Dame de Puy, with other chapels, various tombs, and the stalls, finished in 1520 by Arnault Boullin and Alex. Huet, these last being given to scale as well as in perspective, portions of the west front and several details, are given by TAYLOR, etc., *Voyage Pittoresque de la France* (Picardie, vol. iii), fol., Paris, 1835-48, with numerous vignettes of old edifices in the text, as well as special illustrations of the Tour de Beffroi, the tombs of the Counts of Lannoy in the deserted church of S. Remi, now a stable, capitals in the church of S. Martin aux Jumeaux, the towers of the logis du Roi and of the ancient baillage, with several old houses, one dated 1555, and wells dated 1585.

The hôtel de ville, built in 1600 by Henri IV, containing a collection of modern French paintings, with the painted arcades which line its base, and the large council hall; the college, académique, or university, formerly the abbaye de S. Jean; the grand seminary or public school, with its magnificent stairs and columned chapel, are amongst the other striking features of the city, which also possesses the collegiate churches of S. Firmin and S. Nicholas (twelfth to thirteenth century, MILLIN, *Antiquités Nationales*, vol. v, art. 51), besides eleven parish churches and several conventual establishments; a building called *Malmaison*, occupied by the exchange and the school of design; the library, a handsome edifice, having a peristyle of Doric columns, and containing forty-five thousand printed and four hundred MS. volumes; the halle au blé; the hôtel of the old gardes-du-corps; the palais de justice for the cour-royale and tribunal of commerce; the préfecture; the *Hôtel-Dieu* or general hospital, and the free hospital, or *Maison de Santé* for convalescents; a fine chateau d'eau; a theatre; a museum; an academy of sciences, belles lettres, and arts; and a *mail*. The abbey of S. Acheul, on the outskirts of the city, has become celebrated for the college founded there since 1815 by the Jesuits: its crypt contains some ancient tombs and bas-reliefs. w. h.

GILBERT, *Descr. Hist. de l'Eglise Cath. d'Amiens*, 8vo., 1835; RIVOIRE, *Desc. de la Cath.*, etc., 8vo., 1806; DUSSEVAL ET SCRIBE, *Amiénois*, 2 vols., 8vo., Paris, 1839; CHAPPEY, *Cathédrale d'Amiens*, 4to., 1826. The sculptures, etc., are also shown in *Moyen âge pittoresque*, pl. 122 and 123; *Moyen âge monumental*, pl. 44; RIGOLLOT, *Atlas de l'essai sur les arts en Picardie*, 2 vols., 8vo., Amiens, 1840, pl. 19-37; WILLEMIN, *Monuments inédits français*, vol. i, pl. 90; LA BORDE, *Monuments français*, vol. 2, pl. 144-146; RAMÉE, *Manuel d'Architecture au moyen âge*, 12mo., Paris, 1843, vol. 2, p. 337; WINKLE, *French Cathedrals*, 8vo, London, 1837.

AMIGO (JAIME), a native of Ulldemolins, in Catalonia, was a priest, and in 1550 rector of Tibiza, in the diocese of Tortosa. His talent, knowledge, and good taste in the fine arts, procured for him great reputation as an architect, and the patronage of the duke de Cardona, of don Antonio Agustín the archbishop, and of the chapter of Tarragona, so that nothing was done to the cathedral of that city between the years 1561 and 1586 without his superintendence, or at least his approbation. He was employed in 1561 in the execution of the *trassée organique* for the chapter; managed the sale of the jurisdiction and seigniorship of Reus from the duke to the chapter in 1576; superintended the erection of a mill on the river Francolí; designed and executed the portal and the chapel del S. Sacramento, which were begun in 1582, at the archbishop's own cost; designed a magnificent alabaster monument for the archdeacon, which was not executed because the chapter required security for its completion; superintended the repairs of the Nebot chapel; and designed the parish churches at Selva and at Ulldemolins, which are alike and were executed in the same year, 1582. Notwithstanding all these employments he chiefly resided in his parish. 66.

AMITERNUM. A city of the ancient Sabines, which laid claim to very considerable antiquity; the ruins, comprising walls of polygonal work and an amphitheatre, are still visible at and near a village called S. Vittorino. It was an episcopal see as late as the eleventh century, at which period its inhabitants were removed by the emperor Frederick II to the neighbouring city of AQUILA in the kingdom of Naples.

AMITITAN, in Guatemala, see **AMATITLAN.**

AMMA (Gr. ἄμμα). A Greek measure of length, equal to forty cubits (πύχεις), or sixty feet (πῶδες). 78.

AMMAN or **AMMON**, in Syria, is supposed to be the Greek **PHILADELPHIA.**

AMMANATO (**BARTOLOMMEO**), born at Florence in 1510 or 1511, was the son of Antonio of Settignano. While very young he inherited a small property from his father; and having chosen sculpture as his profession he studied at 12 years of age under Baccio Bandinelli, from whom he went to Jacopo Tatti (Sansovino) at Venice, who imbued him with a taste for architecture also. At the age of 24 or 25 years he studied the architectural antiquities of Rome, where he was patronized by Michelagnolo Buonarrotti, and in conjunction with Vasari executed the tomb for the Cardinal Monti, afterwards Pope Julius III, in the church of S. Pietro in Montorio: for the same patron he executed the nymphæum or fountain at the extremity of the first court of the villa Papa Giulio, and the loggia behind it, in which he has left an inscription bearing his name. The merits of this work are fully discussed by LETAROUILLY, *Edifices de Rome moderne*, 4to. Paris, 1840, p. 463. The palazzo Rucellai, afterwards Gaetani, and now Ruspoli, in the Corso, built in 1556 (**FERRERIO**, pl. 18), is attributed by MILIZIA, *in vita*, to Ammanato; but **MURRAY**, *Handbook*, states that the superb cornice was subsequently designed by Bartolommeo Bruccioli, and the staircase by Martino Lunghi. MILIZIA also ascribes to him the commencement of another palazzo, of which he says "the foundations only are seen," situated almost opposite to the last named, at the corner of the Via dei Condotti, and the palazzo Sagripante, in the Corsini family, near the piazza di S. Apollinare. He also designed and built in 1564, in the via dei Bottegghi Oscure, the Palazzo Mattei, afterwards Negroni, as it is still called, although it now belongs (having passed from the Durazzo family) to the Gaetani, dukes of Sermoneta. **FERRERIO**, *Palazzi di Roma*, pl. 29; LETAROUILLY, p. 353. LETAROUILLY, p. 373-375, has given much attention to another work, commenced by him in 1582, viz., the Collegio Romano (**FERRERIO**, pl. 34), or at least the façade and grand cortile, with the apartments for a thousand pupils of the Jesuits. MILIZIA, *in vita* Cerati, mentions that the great gate of the garden of the palazzo Venezzè at Padua, in form a triumphal arch (a work worthy of observation), and the monument to Benavides in the neighbouring church of the Eremitani, were designed by Ammanato; who was also employed at Pisa; on the ducal palace at Lucca, 1578, and other places. At Florence he erected the large apartment on the south side of the great hall of the council, in the palazzo della Signoria, as is mentioned by **VASARI**, *in vita* Pollaiuolo; and the second cloister of the monastery of S. Spirito; he was employed by the grand duchess Eleonora to continue the building of the palazzo Pitti, in which he added the mouldings and pediments to the arched windows of the first story, added the wings, and erected the cortile, which is surrounded on three sides by a portico of as many orders in height, Doric, Ionic, and Corinthian, the columns engaged one half in the wall, and the whole being in rusticated work; (this has since been imitated by De Brosse at the Luxembourg, by the desire of Maria di Medici); the elliptic grotto of the Doric order at the end of this cortile has been highly praised. The grand duke Cosmo I employed him in several small works which increased his reputation; such as the fountain which still bears his name in the gardens called Pratolino, and that in the piazza del Palazzo Vecchio, which he obtained in competition with Giovanni di Bologna and Benvenuto

Cellini. He was also engaged in military and civil engineering. He almost rebuilt the Ponte alla Carraja at Florence, and erected the bridge della Trinità after the inundations of 1554; this last is 350 feet long, consists of three flat pointed arches, the meeting of the curves at the crown being concealed by an enriched key-stone, which gives them the appearance of being elliptical. The centre arch is 96 feet span, and each of the others 86 feet, the width of the piers 26 feet 9 inches, and the total width of the bridge 37 feet, the internal clear dimension between the parapets being 33 feet. The structure is of marble; it was commenced 30 May 1567, and finished 15 Sept. 1570, at a cost of 46,480 piastres. **FERRONI**, *Della vera cattedra*, etc., 4to., Verona, 1808. Vulliamy, *The Bridge of Santa Trinità*, etc., fol., London, 1822; *Transactions of the SOCIETÀ ITALIANA*. This has always been considered to have surpassed every similar work then existing, and was unequalled from the time of the revival of architecture until within the last hundred years in England.

Ammanato also designed at Florence the palazzo built by order of Don Fabio Arazzuola Arragona, a Spaniard, marquis of Mandragone, and maestro di camera to the grand duke Francis; another for the Giugni family, opposite the convent of the Angioli; and not far from thence he erected, for the guild of Cloth-workers, three houses, which were described at the time as being very beautiful, and as situated "between the Fulling Mill and the corner *alla Catena* turning into the Via della Pergola." He erected the church of S. Giovannino at Florence, at his own expense, and died at the age of 82, in the year 1592. A manuscript work called "La Città", composed by him and containing designs for all the various edifices necessary in a large town, was last heard of in the Gallery at Florence, which also contains the manuscript account of the erection of the above-named bridge, written by his assistants Alfonso and Giulio Parigi.

AMMEL, more properly **AMEL**.

AMMITE, perhaps improperly written **HAMMITE** (from ἄμμος, the Greek word for sand). A variety of sandstone or freestone, having the durability of Caen, with the fine grain of Maltese stone; it is of a pale brown colour, and looks well in the mass when erected. **COCONES.** W. H.

It possesses a trace of magnesia, and is found, but not in large quantities, wherever the oolites (of which it may be considered the minutest-grained quality) run into contact with the limestone: its power of retaining an arris is extraordinary; mouldings of three centuries in age, as at Aix-la-Chapelle, being as perfect as when first cut; and the face remains free from vegetable matter, whereas the concreted oolites are generally found covered with such matter, or in a state of decomposition.

AMMON or **AMMAN**, in Syria, is supposed to be the Greek **PHILADELPHIA.**

AMMONIA, or ammoniacal gas. The modern term for the *volatile ALKALI*: the name is derived from sal ammoniac, whence it was first artificially procured as a gaseous body; it is now obtained by several chemical processes, such as the action upon tin filings, iron, or phosphorus, of diluted nitric acid with the subsequent addition of lime: according to **AUSTIN**, **VAUQUELIN**, **DULONG**, and **CHEVALIER**, it is formed during the oxidation of iron in contact with water and atmospheric air; the rust, or peroxide of iron formed within buildings is capable of absorbing and strongly retaining the ammoniacal vapours therein generated. *Annales de Chimie*, etc., 24-99. The hydrates of soda, lime, and barytes, produce similar effects, and much ammonia may be evolved by their action upon iron, tin, zinc, and red lead. It is produced in large quantities by the decomposition of most animal matter (except fat), whether the operation be natural putrefaction, or the application of heat. Vegetable matter, if it contains nitrogen, yields ammonia when heated; it is present in coal soot, and the decomposition of coal during the process of manufacture at gas-works, is an abundant source of ammonia. It is present in urine, and being very injurious in its effects upon leather, which it renders brittle in a short period,

it is evident that gas unpurified from ammonia, is not good in a library or among leather furniture, and that harness ought not to be hung up in stables. It acts strongly as an alkali, turning vegetable blues to green, and yellows to reddish brown, and saturates acids forming various salts, such as the carbonate and sesquicarbonate, which act like an alkali upon colours, and the bicarbonate, which, when perfect, has no such action. On account of the volatility of ammonia, vegetable colours which have been altered by it regain their original tints as it evaporates, which is not the case when the change has been caused by the fixed alkalis. In 1845 FARADAY stated that he had produced perfectly pure and dry ammonia, as a transparent crystalline white substance, with little odour, and heavier than liquid ammonia, *i. e.*, than the gas rendered fluid by cold and pressure. Chlorhydrate of ammonia (chlorure of ammonium, sal ammoniac) is used in some cases of tinning and soldering. Hydrofluat of ammonia eats into glass, and may be used for the purpose of engraving upon it. ALKALI. ALUM. 40.

AMON-NO, sometimes written AMMON-NO. The city of Amon, thus called in Ezekiel xxx, is generally supposed to be the Greek DIOSPOLIS, or city of Jupiter, now forming a part of the ruins of the Egyptian Thebes; while the No-amon of Nahum iii is assigned to the DIOSPOLIS of the Delta. 14.

AMONTONS (GUILLAUME), born at Paris, 31st of August 1663, became nearly deaf at an early age, in consequence of some severe illness. He applied himself to philosophical pursuits with the greatest success, as shown in his papers on the telegraph, the relative strength of animals, and on the elasticity of the air. He also devoted his attention to architecture, and was employed upon several public works. 83.

AMOUDRU (ANATOLE), born 6th January 1739, at Dôle, was educated for two years at Dijon as an architect; whence he went to Paris to study under J. F. Blondel. He accompanied his master Louis to Warsaw; and on his return to France was employed on several buildings, especially the chateau de Fresnes, near Vendôme, built in 1765. Having returned to Dôle in 1775 he studied the law, was admitted as advocate into the parliament, elected in 1790 the first mayor of the town, was made judge of the district, but resigned in 1797, retaining, however, the appointment of architect to the Board of Waters and Forests for the eastern provinces of France until the Revolution. He printed the result of his labours in the *Cadastre parcellaire de la Ville*, 4to. Dôle, 1808; and *Des mesures agraires en usage en Franche Comté*, in which he determined the length of the old Burgundian foot. He died 8th March 1812. 84.

AMPHIPROSTYLE (Gr. ἀμφί, on both sides; πρὸ, before; στῆλος, a column. A term applied by VITRUVIUS, iii, 1, to a temple having columns in the rear, which form the posticum, as well as those in the front, which form the pronaos; and having, according to the inferences derived from the passage cited, only four columns in each front, and none (or by another inference not more than seven) on either side. The term is applied to the Ionic temple on the Ilissus.

AMPHITHALAMUS, is explained by BEKKER, *Charikles*, to mean a chamber, which was not the principal bedchamber, but opposite to it, and opened out of a passage, which ran between them, and served for the waiting women. BATISSIER, p. 190, considers that it was the conversation room or parlour, but VITRUVIUS vi, x, is the authority for the word in reference to its use for the chamber, if the text be uncorrupted from ANTITHALAMUS.

AMPHITHEATRE (It. and Sp. anfiteatro; Fr. amphithéâtre; Ger. amphitheater). A building erected by the Romans in a circular or oval form, having an area (ARENA) in the centre for the exhibition of combats of gladiators and wild beasts, or for naval spectacles; the area being encompassed by rows of seats (*gradus spectatorum*), formed in ascending tiers, called altogether the visorium. Originally the *forum* served for the gladiatorial displays, and the *circus* for those of wild beasts, whence the amphitheatre is sometimes called circus.

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The term itself, derived from the Greek word ἀμφί, on both sides, and θέατρον, a theatre, seems to intimate that such edifices were amplifications of the previously existing theatre: how such edifices, first used in Italy, acquired a Greek denomination, remains a matter of curious enquiry. ATHENÆUS iv, 17, expressly states that Etruscan assistance was obtained by the Romans in celebrating their games, and it would appear that till a late period the amphitheatres were simple excavations with seats formed of turf. In England, the Druidical temples seem to have been surrounded in many cases by raised banks of earth, on which the spectators could sit or kneel to behold the religious ceremonies, and these banks are also at present called amphitheatres. Amphitheatres were sometimes excavated on the side of a hill, advantage being taken of such a position to render in an economical manner the optical and acoustical arrangements as perfect as possible. That attributed to the Etruscans, at Sutri, is excavated in the tufo rock, and is so perfect as perhaps to be unique. The steps are worn in some places, but all the corridors and vomitories and six rows of stages are preserved. There is no masonry, but in the few places where deficiencies in the rock occur brickwork has been employed. CALINDRI gives the length 290 and the breadth 270 feet. It is ascribed to Statilius Taurus. w. h.

PLINY, *Hist. Nat.*, xxxvi, 15, relates that the amphitheatre of C. Scribonius Curio, at Rome, which is the first mentioned by any classic writer, was composed of two theatres, so constructed (a clever geometrical solution of the problem, by WEINBRENNER of Carlsruhe, is given in the *Magasin encyclopédique*), that at one time the ALNI or backs of their semicircular portions should touch each other, and at another they could be united on the line of their diameters. This building was of wood, as were also those erected by Pompey and Cæsar at Rome; that at Fidenæ, built in the reign of Tiberius, which buried the spectators in its sudden fall; that built at Rome by Nero; and that at Placentia, which was burnt in the war between Otho and Vitellius. A painting found at Corneto, and reputed to be Etruscan, represents a gladiatorial combat in the midst of an amphitheatre, the seats of which are supported by scaffolding. ENCYCLOPÉDIE PITTORESQUE, i, 477.

An amphitheatre of an apparently more durable material than wood, was erected by Statilius Taurus in the Campus Martius at Rome, *s.c.* 29; the walls only, however, could have been built of brick or stone, for it was destroyed by fire A.D. 64: the present Monte Citorio is supposed to be composed of its ruins. In the lower eastern angle of the walls of Aurelian, within the precincts of the church of Sta. Croce in Gerusalemme, in the same city, are some remains of a building called the *amphitheatrum castrense*, and attributed to the first century of the Christian era: they are entirely of brick; little remains of a second row of arches: but some arches of the first tier now filled up, and some half columns of the Corinthian order with brick capitals, are still to be seen. The term *castrense*, however, generally implies little more than an excavated basin, the *agger* of which formed the seats. Rome was enriched with another amphitheatre, in the Campus Martius, built by Trajan, but destroyed by Adrian; and with one whose remains now exist in that noblest of all ruins, the COLISEUM.

In the most durable, regular, and magnificent examples, the floor of the area, properly called ARENA, was sometimes pierced with trapdoors, which facilitated the displays of various devices. Admission to the arena was given by large doors at each end of the major axis, if the amphitheatre were elliptic, or opposite to each other, if it were circular; that through which the slain were withdrawn was called the *porta libitinensis*. The arena in early times was surrounded by a fosse or moat full of water, EURIPUS, which was abolished by Nero; as well as by a wall, RODIUM, with a parapet, *lorica*, for security, which rose twelve or fifteen feet from the floor. Above this wall was the gallery or reserved seats: the consuls, senators, ambassadors, vestal virgins, and the higher magistracy, were seated on the first

row, *subsellia*, and over the two doors of the arena were the imperial boxes, each a *DAIS* (in the original French sense of the word), *cubiculum* or *papilio*, on which was placed the throne, *puleinar suggestus*. The podium was finished with a parapet and an iron grating, *ferrea clathra*, which with the fosse secured the spectators from ordinary danger of any attack of the animals in the arena: it is to be observed that when the podium was erected, the term in the arena is substituted in classic authors for the more correct expression on the arena. BIANCHI and RE, *Osservazioni sull' arena e sul podio dell' anfiteatro Flavio*, etc., fol. Rome, 1812. The podium was the commencement of the visorium, and was separated from the back seats by a low wall, *balteus*, sometimes decorated with niches, columns, and statues; behind the balteus several ranges of seats, *gradationes*, were constructed, forming distinct stories, *maniana, cavee*, which were divided from each other by galleries, *præcinctiones*; while staircases, *scale, scalaria*, subdivided each story of seats into wedge-shaped blocks, *cunei*. The seats immediately above the podium were reserved for the priests, knights, and inferior magistracy; those still higher, *popularia*, for the citizens; and a special one for females; while the highest of all was occupied by the slaves. The attic wall of the amphitheatre was furnished on the outside with consoles, and stone rings over them, in which were placed the masts to receive blocks and pulleys, by means of which the VELARIUM was worked.

When the amphitheatre was built, and not excavated, the space underneath the steps was filled in with several stages of vaulted passages, *fornices, concamerationes*, containing also the staircases, off which the visitors entered each *præcinctio* by openings, *comitaria*, in the lower wall of each *cavea*.

With regard to the substructions there is considerable uncertainty whether the animals, after they were brought from the VIVARIUM, were placed in cellars or cages, *caveæ ferarum*, under the arena, as stated by some authors, or in dens under the podium. A drain, 2 feet 6 inches wide, went round the floor of the second corridor of the Coliseum, and received the water from the perpendicular conduits and from the drain, in the third corridor, which is 3 feet deep and 1 foot 5 inches wide; the sides of these drains are cased with tiles; another drain of the size last specified encompassed the outer side of the third corridor; and other drains communicated with these towards the arena, in various directions; all were conducted into one large sewer which encircled the edifice.

The amphitheatre at Verona can hardly be called a ruin, as the interior is nearly perfect, owing to its use for tournaments, etc., during the middle ages; the exterior circuit has lost all but four of its seventy-two arches, which were damaged or destroyed by an earthquake in 1184. Those at Capua, Pæstum, Pompeii, and Pola, are also in tolerable preservation; the seats in the last named were probably of wood, as was the case at Padua; and at Tusculum enough remains to prove that the amphitheatre, built of opus reticulatum, was 225 feet long and 166 feet 6 inches broad: those at Albanum, Amiternum, Ancona, Arretium, Beneventum, Citta Lavinia, Fiesulæ, Florentia, Lucca, Luna, Placentia, Pollentium, Spello, Terni, Velleia, and Volterra, are more or less obliterated: in Sicily there are several, besides the chief ones at Agrigentum, Catania, Syracuse, Taormina, and at Cassano, five miles from Palermo, which is one of the most perfect in the kingdom of Naples. In Spain, those at Italica or Hispalis, Seguntum, and Tarragona, may be mentioned.

With regard to the remains at Anamour, Argos, Corinth, Jerusalem, Melos, Sardis, Smyrna, etc., it may be observed that TEXIER, *Descr. de l'Asie Mineure*, fol. Paris, 1849, ii, 174-227, pl. 106, 120, 121, 122, observes that he is not aware of any example in Greece, that he had only met with those at Cyzicus and Pergamus, in Asia Minor, and that all which remain may be regarded as Roman works executed within the first three centuries of the Christian era. Those at Pergamus and Cyzicus, are interesting as being situated on brooks which run through

the buildings in the direction of the major axes, so that the arena might be inundated at almost a moment's notice, when required for representations of naval combats. NAUMACHIUM. TEXIER also mentions two amphitheatres which are rarely noticed, viz., that at Cimiez (Cemenelum), near Nice, with an arena nearly of the same size as that at Pergamus; and that at Rusiciada in Africa. Of this last not much is known, and the same observation applies to those at Constantina; El-jemm; and Udena, which is twenty miles south of Tunis. In France, those at Arles; Autun, with four stories, like the Coliseum; Fréjus; Lyons; Nîmes, which is in the best preservation after that at Verona; and Saintes, are the existing examples; those at Agen, Angers, Avenches, Baray, Beauvais, Besançon, Béziers, Bordeaux, Bourges, Bruyères, Cahors, Cormier, Die, Doue sur l'Iger, Douai, Dreunault, Dreunault, Grand, Levroux near Issoudun, Limoges, Mans, Metz, Montargis, Narbonne, Nérès, Orange, Paris, Périgueux, Reims, Rhodéz, S. Michel-de-Touch, Tintinnac, Toul, Toulouse, Vallonges, and Vienne, have suffered almost total demolition. In Switzerland others existed at the ancient Aventicum Helveticum, and Augusta Rauracorum: at Treves some peculiarities of construction are remarkable in the ruins of another example. In England there are remains of such constructions, as the *amphitheatrum castrense* at Cirencester, the site is still called the Bullring; that at Dorchester is considered the finest specimen remaining in England; besides these there are some ruins at Caerleon, Redruth, Richborough, Silchester, and Verulam. GWILT, *Encyc.*, also specifies in the list of principal amphitheatres, of which remains still exist in Italy, one at Alba; another near the Tiber, at Otricoli; one of brick, at the foot of Monte Casino; one at Minturnum (Torre, on the banks of the Garigliano); another at Pozzuoli, in which parts of the arcades and caves for wild beasts still remain: indeed, wherever Roman remains are found to any extent, whether at home or abroad, some indication may almost certainly be discovered of the existence, at some time, of an amphitheatre; and these enormous works are often almost the sole visible indications of the site of an ancient city.

Comparative table of the principal dimensions of several existing amphitheatres:

Amphitheatre	Major axis m	Minor axis m	Major axis feet	Minor axis feet	Surface of Arena
Pozzuoli	626.6	475.4	2088.8	1574.1	62,215
Tarragona	485.0	390.0	1591.5	1278.2	39,304
Rome	616.0	510.8	2021.0	1681.1	38,834
El-Jem (Tunis)	457.2	302.2	1501.3	989.8	37,425
Capua	557.5	458.0	1829.9	1487.0	29,166
Vercina	505.10	270.0	1658.8	885.8	28,370
Pola	472.1	360.5	1549.2	1178.1	26,188
Arles	447.9	375.6	1469.0	1229.5	23,089
Nîmes	433.8	333.7	1423.2	1098.5	22,498
Pompeii	445.0	341.5	1460.1	1115.1	19,723
Pergamum	416.9	420.3	1368.3	1378.5	15,400

MAFFEI, *Degli anfiteatri*, 12mo., Verona, 1728, and translation by GORDON, 8vo., London, 1780.

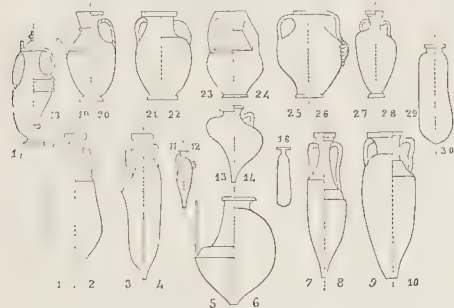
The two names, amphitheatre and circus, are indifferently applied in modern Europe to a structure fitted up for exhibitions of equestrian agility, or for pageants in which horses and other animals are introduced. The bull fights in Spain still take place in such buildings; and at Nîmes the ancient edifice was used for the *ferrade*, or branding of wild bulls; but the entertainment was prohibited by Louis Philippe. Besides those which have been familiar to the inhabitants of London, the most celebrated modern examples are those of Milan, called the Arena in the piazza d'Armi, designed by Canonici about 1807, for shows and horse races, and calculated to contain 30,000 spectators; it measures 800 feet in its longer diameter and 400 feet in its smaller, and can be flooded; the Cirque Olympique, in the Champs Elysées, and the Cirque Napoléon (1853), at Paris (BUILDER JOURNAL, vols. x, xi), were both designed by Hittorff.

AMPHITHEATRE is also used by French architects to designate the semicircular ranges of seats placed between the parterre, or

pit, and the boxes of a French theatre; but French managers of theatres in London apply the term to the front half of the seats in what is called in England the lower, if there be more than one GALLERY. It is also the technical term of the French architects for an ANATOMICAL THEATRE.

AMPHITHURA (Gr. ἀμφίθυρα). The veil or curtain, opening at the sides, not in the centre, used by the Greek Catholics to separate the chancel from the church. 19.

AMPHORA (Gr. ἀμφορέα). A jar often seen among the decorations of Roman tombs. The definition of this term given by GERHARD and his followers, viz. "a two-handled vase of various forms and sizes, but generally tall and full-bellied", leads to considerable confusion, as it seems to set aside the usual acceptance of the word for the long thin vase with a pointed



foot, seen in the Pompeian paintings, such as figs. 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, which was sometimes let into the floor or into a stone disk, or it might either be surrounded by a wall, or be supported by a wooden frame: although generally placed upright, instances have occurred in which these jars have been found lying on their sides. Neither does the usual restriction of the meaning to "a wine vase with two handles", seem to be more correct, for several of the examples, such as figs. 6, 29, 30, in the accompanying illustration, have recently been found to contain portions of corpses; while some appear to have had but one handle, if any at all. It is not difficult to imagine that the peculiar "alabastron" form, shown in fig. 16, may have been the original type of this kind of vase: it is seen at the British Museum (whence all these figures have been taken), in the Assyrian and Egyptian collections, as well as in those allotted to the Etruscan, Greek, and Roman departments of art. Most of those represented by figures 17 to 28, are painted; fig. 9 is covered with ornament, and figs. 5 and 26 are in bronze. Amphoræ, as Roman and Greek measures, contained from seven to eleven gallons; but they have been found of all sizes, one being so large as 5 feet 6 ins. in diameter, and 5 feet in height, and another holding one hundred and fifty gallons. Although made of gold (*Iliad*, xxiii, 92; *Odys.*, xxiv, 74), of onyx (PLINY, *Hist. Nat.*, xxxvi, 7, § 12), of glass (PETRONIUS, 34), and of stone (*Odys.*, xiii, 105), the usual material was earthenware: those of Samos and Chios were esteemed the finest quality. A discovery made at Salona, in 1835, proves that amphoræ were used for coffins, and they are mentioned as cinerary urns by HOMER (*Iliad*, xxiii, 91, 92) and by SOPHOCLES (*Fr.*, 303). They were used also at Rome, until the time of Vespasian, for public conveniences, for which fact the reader may consult PROPERTIUS, iv, 5; LUCRETIVS, iv, 1023, and MACROBIUS, *Sat.*, ii, 12. The name of the maker and of the place of manufacture were usually stamped upon them, and they have been found inscribed with the names of magistrates, dates, etc. Reference for their employment in buildings may be made to SEROUX D'AGINCOURT, *History of Art*, fo., Lond., 1847 (architecture, pl. 22, 23, 71), illustrating application of various forms of these vases in POT CONSTRUCTION, for vaulting, etc.

AMPIGLIONE (the ancient EMPULUM). A town near Tyrol, in the Papal States. Among the ruins of the modern

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town may be seen an example, probably the most ancient in existence, of the Pelasgian style of construction in tufo. It is entirely of polygonal work. 28.

AMRAPOORAH, in Hindostan, see AMARAPURA.

AMSTERDAM, or AMSTELRIDAM as it was originally called, is the capital of the kingdom of Holland, and situated on the Ai, Ij or Y, a branch of the Zuyderzee. It is a fortified town, built on piles, in the marshy lands formed by the junction of the river Amstel with the Veght, a branch of the Rhine. Underneath this morass, at a depth of about fifty feet, is a bed of sand, ten feet thick, into which the piles are driven; on these the buildings are reared. Below the sand is a stratum, 172 feet deep, of hard clay, and then sand again occurs. (HALMA and BROUWER, *Tooneel der Vereenigde Nederlanden*, Leeuwarden, 1725.) The town is said to be divided into ninety-five islands, communicating by two hundred and ninety bridges: the finest of these, called the Amstel bridge, commenced in 1662, is 614 feet long and 65 feet wide, with thirty-four arches built of brick, with voussoirs of Bremen stone; two central arches were made into one, in 1822, to allow the passage of vessels. Quays are on each side of the four great canals, of which one is 140 feet wide and about two miles long. These quays are lined with handsome houses; and in their buildings, as well as dimensions, may vie with some of the finest streets in Europe. The houses are of four or five stories in height, and are chiefly built of soft bricks, variously coloured, red being the predominant tint, but diversified with yellow or brown, whence the streets have a rather gay appearance. Some of the houses have forked chimneys and projecting pointed gables (many of them leaning forwards or backwards); the avenues of trees along the canals render large places unnecessary. The public buildings are numerous, but few are worthy of particular notice. Among the best is the palace, until 1808 the Stadthuis, a stone building, 262 long, 218 ft. deep, and 108 ft. high to the ridge, illustrations of which were published by the architect, JACOB VAN CAMPEN, *Afbeelding van't Stadt Huys*, fol., Amst., 1661. It was begun in 1648, on 13,659 piles, and is chiefly remarkable for one large hall, 111 feet long, 53 feet wide, and 65 feet high to the springing of the coved ceiling; and lined with white Italian marble. The works were finished by Campen and Daniel Stalpart in 1655; the building was nearly destroyed by fire in 1762 and in 1806. The Stadthuis, or town-hall, formerly the Admiralty, built in 1661; the present Admiralty, almost a separate town, with its magnificent arsenal and naval and artillery schools; the houses of the East and West India Companies, and of three other societies, including the Concordia et Libertas, and that called Felix Meritis, which possesses a library, museum, gallery of sculpture, laboratory, observatory, and concert room; the bourse, or new Exchange, situate in front of the palace, and commenced in 1844; the bank; the weigh-house; the general store-house, formerly the naval magazine; the Orange-Nassau, or S. Charles barracks, for 3,000 men, built in 1800, 900 feet long by 140 feet wide; the Palais de Justice, opened in 1836; and the two railway stations, are leading features.

Besides these edifices the city contains forty-eight places of worship, four synagogues (that belonging to the Portuguese being the handsomest), and two English chapels. Among the churches, the Oudekerk, dedicated to S. Nicholas, dates from the commencement of the fourteenth century; it is 279 feet long, with transepts 210 feet in length across, and is celebrated for its vaulting, and for three windows of painted glass, executed between the years 1549 and 1648. The Nieuwekerk, dedicated to S. Catherine, rebuilt 1645-50, one of the finest churches in Holland, is 293 feet long, and 195 feet across in the transepts; the nave is divided from the aisles by massive pillars, carrying an architrave broken by the arches, and is particularly noted for its elaborate pulpit (1649) and a fine brazen screen, 30 feet high, with twenty columns, and two gates ornamented with beautifully-executed foliage. Two prisons; six theatres; above forty institutions of charity and benevolence, of which the hos-

pital for Protestant aged men and women is more like a palace than an almshouse or provident asylum; six houses of correction; the lazaretto; the cornmarket; the Haringpakkerstoorn and other towers; the Athenæum, or college; the late Royal Academy of Fine Arts; the Royal Institution, two museums, the post office, and the music school,—are the other public buildings of importance: most of them were constructed in the seventeenth century. The city also possesses a theatre of anatomy, a *jardin des plantes*, besides numerous well supported and managed societies for the promotion of arts, commerce, and manufactures. A plan of the town is published in the maps of the Society for the Diffusion of Useful Knowledge, No. 162.

COMMELIN, *Verfolg van de Beschryving der Stadt Amsterdam*, fol., Amst., 1693; VINGBOONS, *Gronden en Afbeeldsels der voornaamste Gebouwen Amsterdam*, fol., Amst., 1665; WAGENNAAR, *Amsterdam, in zyne opkomst aanwas*, etc., fol., Amst., 1760-67.

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AMURCA (Gr. ἀμόρρη). According to BATISSIER, *Histoire de l'Art monumental*, 8vo., Paris, 1845, this word signified a mixture of the lees of oil (the refuse of expressed olives), with olive leaves and clay, to form a stucco for the walls of granaries and like buildings in the Roman *villa rustica*.

AMUSSIS or AMUSSUM. This term is used by VITRUVIUS (i, 6) for a slab or plane-table of marble; and later authorities have stated that it was neither a *regula* or straight-edge (perhaps a level), for testing the uniform evenness in the surface of a wall or course of masonry, nor a *libella* or plumb-line, nor a *norma* or square, for testing a right angle, as many commentators have explained it; but a perfectly true table, which, when dusted with red ochre, and applied to other work, showed the inequalities of that other work by the spots of undisturbed colour which remained upon its own surface.

AMYGDALATUM OPUS, a modern term for a species of opus reticulatum, used in a note on page 27 of VITRUVIUS, fol., Amst., 1649.

AMYRIS BALSAMIFERA. A native wood of Honduras, etc., from which one of the species of ROSEWOOD is obtained. It is used in cabinet work, turnery, and brush-making. *A. maritima* (*cuaba amarilla*) and *A. sylvatica* (*cuaba blanca*) natives of Cuba, and are used for the same purposes; *A. polygama* is a timber tree of Tuscany.

71.

ANABATHRA and ANABATHRUM (Gr. ἀναβάθρα, ἀνάβαθρον). A term used by the Romans for the steps to any elevated situation, as a pulpit, and sometimes technically used for temporary wooden seats ranged in steps. It was also frequently applied to the steps now called horse-blocks or mounting-stones, formerly placed in streets and highways to render it more easy for travellers to mount and dismount; an invention attributed to Caius Sempronius Gracchus, who died B.C. 121. The word was sometimes used for the pulpitum or desk to which the steps first mentioned might lead.

80.

ANACAMPTERIA (Gr. ἀνακίμπτρια, late Latin, *cellulæ diversoriæ*). Apartments appropriated in religious houses, as the lodgings of persons who sought the privilege of sanctuary, which were rendered by the laws of Theodosius as sacred as the altar. BINGHAM, *Opera*, i, 314.

ANACAMPTICS. The theory of reflected light. CATOPTICS. ANACARDIUM LATIFOLIUM. A native wood (*bléla*) of Gualpara, East Indies, is used in making chests and couches. A species growing in the woods of Tavoy (Thubbamboo), where it forms a large tree, is used more especially for boat-building. The anacardium of the West Indies grows to a great height, and produces the cashew or acajou nut, from which is extracted an oil or varnish, which becomes of a lasting black colour, and is said to preserve wood from putrefaction.

71, 13, 14.

ANACHORITA. This term is evidently the same as ANCHORIDGE, as appears from a passage which DUCANGE quotes from the *Inquisitiones Archidiacon. Lincolnensium*, A.D. 1233, cap. 48, viz. whether any anachorita be made without consent from the bi-hop?

80.

ANACLASTICS. The theory of refracted light. DIOPTRICS. ANAGLYPHIC. Embossed work, in opposition to DIALYPTIC.

ANAGNI (the ancient ANAGNIA). An episcopal see in the delegation of Frosinone, in the Papal States. It contains a cathedral, under the invocation of the Annunciation of the Virgin Mary; five monasteries; an hospital, and a *seminarium*.

ANAGOGIUM. If this word be not a mistake of a copyist for ANALOGIUM, it is used for a reading-pew in a manuscript collection of *Lives of the Bishops of Dunkeld*, which has been printed by the Bannatyne Club; 4to., Edinb., 2nd ed., 1831, p. 45.

ANALEMMA (Gr. ἀνάλημμα). This term originally meant anything which raised or supported another; it is applied, in the plural, to strong foundations for walls: HESYCHIUS. SUIDAS, s. v. It is also used for a wall, pier, or buttress; and by VITRUVIUS, ix, 4, for a rule of dialling.

23.

ANALOGIA (Gr. ἀναλογία; It. *analogia*; Sp. *proporcion*; Fr. *analogie*; Ger. *gegenhaltung*). A term used by VITRUVIUS (iii, 1), QUINTILIAN, and CICERO, as equivalent to the Latin word *proportio*; i.e., as the commensurability of a settled portion of the members of a work, from which commensurability or proportion the rule for SYMMETRY is to be obtained.

ANALOGIUM. A name given by the Latins to the AMBO, and also to a portable desk or lectern; by the modern Greeks, the word has been applied only to the cushion on which the book is laid. DUCANGE, s. v., also shows that this word was applied to an enclosure of the tombs of saints, etc. ANAGOGIUM.

ANAMOUR. A cape situate on the most southern point of Asia Minor. It appears to be the site of a place of some note, as two aqueducts still remain; being on different levels, one supplied the town of Anemurium, and the other the castle. Both are cut through the solid rock, or raised on arches where they cross the valleys. The date of these works is not known, but the channels are even now perfectly clear from any *débris*. There are also the remains of two theatres, one of which appears to have been roofed; and the other is similar to those buildings which were used for gladiatorial feats. The cemetery is situated outside the walls, as in all Eastern towns; the tombs consist of two chambers, having arched roofs, and in some instances domes rising from the centre. From the absence of any human remains, and of any explanatory inscriptions, it is supposed that the bodies were burned, and the ashes deposited on the earth, and not in vases.

W. H.

ANAN, or AMAN. The native name for a wood of Tavoy and Amherst, East Indies. It forms a small tree useful for building purposes, more especially in constructing temples; it is of a yellowish-white colour, and is a heavy, durable wood. The name is given to the CYRTOPHYLLUM *fragrans*, growing in the woods of Tenasserim, which is reported to produce one of the hardest and most compact woods known.

71.

ANAPIESMA, sometimes written ANAPEISMA (Gr. ἀναπέσμα). This word is explained by BATISSIER, *Histoire de l'Art monumental*, 8vo., Paris, 1845, as the term for the contrivance arranged in the ancient Greek theatres for the ascent of the deities through the stage. There were two sorts of anapiesmata; one under the proscenium for the marine deities; the other, behind the stairs from the postscenium into the orchestra, for the demons and furies.

6.

ANAPLI, more correctly NAUPLIA, and see TIRYNS.

ANARAJAPURA, in Hindostan, more correctly ANURADHAPURA.

ANATARIUM (Gr. ἀναστατήριον). The Roman name for a duck house, or more properly the yard and house for rearing ducks, which consisted of a flat piece of ground, if possible marshy, surrounded by a wall 15 feet high, stuccoed on both sides, along which a series of covered nests of hewn stone were placed on an elevated ledge. An open space above is covered with trellis work. A shallow pond with a margin of opus signinum, planted with shrubs, and a canal of running water, should contain the food. The eggs are hatched by hens.

ANATOMICAL THEATRE (Fr. *amphithéâtre*; Ger. *zergliederungs schau-gerüsthaus*). A hall in which steps or ranges of seats rise one above the other in concentric circles for the accommodation of the students, who thus surround the operator or demonstrator placed in the arena: generally the seats occupy only the half of the circumference of a circle, as is the case at the Ecole de Chirurgie at Paris. The anatomical theatre at Padua is the oldest in Europe, having been built by Aquapendente in 1594, on a suggestion of the celebrated Fra Paolo Sarpi. It must be noticed that the seats should rise rapidly, and the students be kept as close round the table of the demonstrator as possible, in order that they may observe, with greater facility, the operations of the lecturer. In the theatre at the University College, London, a passage is left between the seats and the external wall, for the purpose of keeping diagrams suspended on each side of the passage thus formed.

ANATRON. The nitrous salt which collects upon the walls of vaults and other subterranean places. It is so named from the scum, called also *fel vitri* or gall of glass, that swims on the surface of molten glass in the furnace, and which is nearly allied to common salt. **NATRON.** W. H.

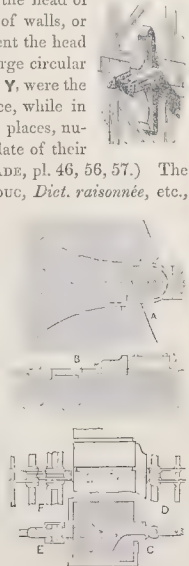
ANCASTER. The name of a village in Lincolnshire, near which are situate the fine stone quarries of the oolite formation, from which the stone used in the erection of the churches of Newark and Grantham, as well as other buildings in the county, were erected. The stone from this quarry retains its arris, as well as its colour; whilst other oolites from quarries of the lime-stone formation lose their colour and become decomposed, even on the face of the ashlar. In the *Builder* journal, vol. xi, p. 569, will be found some notes, etc., upon the buildings erected with this stone from these quarries. W. H.

ANCHASIOS is apparently recorded by PAUSANIAS, ix, 11, to have built with Trophonius and Agamedes the *thalamus* of Amphitryon and Alcmena at Thebes.

ANCHOR. The transverse piece of wood or *stock* of the modern anchor is not found in any of the anchors, generally double-fluked, which are seen on antique works. The anchor has been recommended by CLEMENS of Alexandria as the symbol of faith, rather than of hope, for which it is commonly used. The name has also been misapplied to the tongue or arrow-head placed between the principal ornament of the ovolo, ogee, and other mouldings. **ARROW-HEAD. EGG AND TONGUE.**

The name (It. *ancora*; Sp. *ancla*; Fr. *ancrer*; Ger. *anker*) appears also to have been applied to the head of an iron tie used to resist the bulging of walls, or the thrust of vaulting, etc. At present the head of such ties is generally formed as a large circular plate; but formerly the shapes, I. S. X. Y, were the most common in England and France, while in Flanders, Hainault, Artois, and other places, numerals were used so as to denote the date of their employment. (See illustrations, *FACADE*, pl. 46, 56, 57.) The woodcut is taken from VIOLETTÉ-LÉ-DUC, *Dict. raisonné*, etc., 8vo., Paris, 1853, and is an interesting example of the application of the anchor in timber architecture. 5.

ANCHOR AND COLLAR. The simplest and best means of hanging carriage and other large gates, consists of a forked piece of iron, shaped like the letter Y, laid in a groove cut for it on the hanging stone. The eye at the end of the Y sometimes forms part of the hinge, the eye receiving a hook from a strap bolted to the gate; but the better mode is to use it as a collar fitting the hanging stile or stanchion, as shown, c and d. Figs. a and b are the plan and elevation of an anchor and collar used for lock gates, each of



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which was 10 feet wide, and 18 feet high. Where there is much display in the design, this collar holds the hanging post, as E and F, to which the hinge is attached.

ANCHORIDGE, ANCHORAGE, or ANACHORITA. The room over the vestry attached to the north side of the chancel, and a very common appendage to churches in the north of England, is supposed to have been inhabited by anchorites. This upper room is sometimes approached from the lower one, and often has squints of one or more openings looking towards the altar: in other instances, it has had a separate entrance from the exterior. Squints are sometimes seen in the lower apartment. At Wath, near Ripon, an old chimney still remains. At Gateshead, in Durham, the anchorage is a tolerably large apartment; the bishop's license for assigning a space in the cemetery of Gateshead contiguous to the church, for the purpose of building a residence, and therein "shutting up" an anchoritess, was obtained in 1340. The conditions of obtaining the consent of the rector and parishioners, and of leaving a sufficient place for the burial of the dead, were annexed. The use of these erections is deserving of still further investigation. **GENTLEMAN'S MAG.** 1852, ii, 58.

ANCIENT. A term applied in architectural phraseology to those works of all nations which were produced before the period of the Renaissance; but by custom the words *ANTIQUE*, *ANTIQUO-MODERN*, or *MEDIEVAL*, considerably lessen the period and classes to which this term can be applied.

ANCIENT LIGHTS, see **LIGHT AND AIR.**

ANCISA (Fra PASQUALE DELL') with Fra Pagano degli Adimari conducted the work of enlarging the old church of Sta. Maria at Florence; he also superintended the execution of the design for the church of Sta. Maria Novella, by the Frati Sisto and Ristoro, who had quitted Florence eight months after laying the first stone in October 1278 to work in the Vatican, from 1279 until 1284, when he went to Pistoja to superintend the erection of the church of S. Domenico, begun about the year 1280. 87.

ANCKERMANN (BERNHARD CHRISTOPHER) was an architect at Augsburg, in the first half of the eighteenth century; some plates of plans and elevations of different edifices were engraved for him by Corvinus. 60.

ANCLABRIS. This term is explained as a table on which the sacrificer, in Roman ceremonies, placed his instruments and the entrails of the victims. It also appears that offerings were placed upon it. One found at Pompeii was of bronze, 8 inches long by 7 inches wide, and 8 inches high. **ALTAR.** 79.

ANCON (Gr. *ἀγκών*, the bend of the arm). This term has been applied to the short legs of a right angled triangle, **VITRUVIUS**, iii, 3; viii, 6; and as it represents the two adjacent sides of a rectangle including a right angle, it was afterwards used for the quoins (Fr. *coin*) of a wall, crossbeams, or rafters. **VITRUVIUS** uses the word *ancon* in another sense; viz., for the console or truss (Gr. *ὄψις*) serving as an apparent support to the end of a cornice over the **ANTEPAGMENTA**, or dressings of doors, etc. His directions, iv, 6, appear to be, that the bottom of the truss above the leaf, should be level with the head of the aperture; that it should at top be two-thirds of the width of the dressing; and that the bottom of the *ancon* should be three-quarters of the width of the top. This proportion is not, however, observed in the *ancones* of the beautiful doorway in the north wall of the stoa of the Pandroseum at Athens; **DONALDSON**, *The most approved Doorways from Ancient Buildings, etc.*, 4to., London, 1833. They were also termed **PAROTIDES** and **PROTHYRIDES**. In Roman Africa, *ancon* also denoted a dungeon or little-ease, according to **SUIDAS**, when mentioning the delivery by Belisarius of the merchants imprisoned by Gelimer.

ANCONA. The capital of the province of the same name in the Papal States, and the best harbour on the Italian shores of the Adriatic. The well known arch of Trajan, erected A.D. 112, which has been pronounced to be the most beautiful of its species, stands in the centre of the old mole, which was 500 feet

in length, but has been continued into the sea to the extent of 1,200 feet by Vanvitelli: the junction of the two moles, 68 feet high and 100 feet broad, is marked by a triumphal arch designed by him, and built by Clement XII in honour of Benedict XIV. The lazaretto was also built by the same pope in 1732, from the designs of the same architect; a breakwater, 2,100 feet long, projects from the end of it. The cathedral, which occupies the site of a temple to Venus, was originally dedicated to S. Stefano, but now bears the name of S. Ciriaco; it is said to be of the tenth century, except the front, which was the work of Margaritone of Arezzo, in the thirteenth century; the octangular cupola is considered to be the oldest in Italy. Among the ten churches in Ancona, the most remarkable are those of S. Domenico, rebuilt in 1788; S. Francesco della Scala; Sta. Pelagia; S. Agostino, rebuilt by Vanvitelli, who left unaltered the doorway of the period of the transition from the Gothic into the Renaissance style (the church of the Vergine della Misericordia possesses a similar example); and Santa Maria della Piazza, which is curious although small. There are also fifteen monasteries and convents, and two hospitals. The chief public buildings are the celebrated college of Sta. Chiara di Pace; the church of S. Francesco, now an hospital, with a handsome Gothic entrance; the town hall; the exchange; the palazzo del Governo (1400); the loggia dei Mercanti, which is Gothic, designed by Tibaldi, who built the palazzo Ferretti; and the large prisons for 450 criminals. The ruins of the ancient amphitheatre are scarcely visible. KNIGHT, *Ecclesiastical Architecture of Italy*, fol., Lond., 1842-44; SEROUX D'AGINCOURT, *History of Art, Architecture*, pl. 25 and 72, fol., Lond., 1847; HOPE, *Historical Essay*, 8vo., 1840; ALBERTI, *Theatrum Urbium Italiae*, fol., Bologna. JANSONIUS, *Illustrationum Italiae Urbium Tabulae*, fol., Amsterdam.

ANCYRA in Galatia, Asia Minor; ancient name of ANGORA. ANDERNACH (the Roman ANTONACUM). A city in Prussia, situated on the Lower Rhine, contains a parish church, called a *Dom* on account of its great magnificence, with four towers; a great part of the choir, the towers, and semicircular absis, may be parts of the original church (of the tenth century), and may have escaped the destruction of the city in 1200 by Philip von Hohenstauffen; the remainder of the building, and the tall western towers, probably date from the beginning of the thirteenth century; two tiers of arches of nearly equal height support the clerestory; behind the upper tier a gallery is formed, which is used by the male portion of the congregation, the females sitting below. The towers are square, and those at the west end resemble that at Sompting church in Sussex, in having over each face a gablet, from the centre of which springs one angle of the high roof or spire. The pulpit has been removed from the church of the famous abbey at Laach, eight miles from Andernach, which formerly belonged to the Benedictines, and had 200 chambers and five towers; the church, built between 1093 and 1156, has lately been restored as a very perfect example of a Romanesque edifice; the approach to it is through a cloister at the west end; the tombs, and a chapel of the same date as the abbey church, now used as a granary, are interesting.

Andernach possesses several objects which are interesting either from their antiquity or their picturesqueness: such are the priory baths, and an old gate, both of which are probably Roman works; the ruins of a Franciscan church, consisting of two aisles, date of 1414-1463; the palace of the archbishops of Cologne, the Coblenz gate, both dating perhaps from about the year 1500; the round watchtower, octagonal in the upper part (1520); the crane (1554); and the custom house. The noble ruins of the former convent of S. Thomas, which was burnt in 1773, in which a lunatic asylum has been established, with the chapel of S. Michael (1129) attached to it, are situated a little way outside of the town. BOISSERÉE, *Monuments*, etc., du Rhin inférieur, fo., Paris, 1842; HOPE, *Historical Essay*, 8vo., Lond., 1840.

The neighbouring villages of Ober and Nieder Mendig supply the porous lava of which the celebrated millstones are made; it is also used for paving courtyards and kitchen floors, and has been employed in the construction of some of the oldest buildings in this town and in Coblenz: almost all the doorposts and window jambs are made of this material; while the posts at the corners of streets, etc., are made of pieces of columnar basalt. A species of tufa, called TRASS, is also exported from the neighbourhood of Andernach to Holland. 28.

ANDEROUN. The private apartment behind the *deewan khaneh*, or royal room, in Persian palaces. TEXIER, *Descr. de l'Arménie*, etc., fol., Paris, 1842.

ANDINO (CRISTOBAL DE) designed and executed numerous pieces of metal work, especially the *reja*, or enclosure of the capilla mayor at Palencia, in 1520; that of the chapel of the Constable, in the cathedral at Burgos; and, in 1530, that of the side entrance to the same chapel at Palencia. From these dates it follows that he was the first, before Machuca, Covarrubias, or Siloe, to adopt the style called, at that time, *greco-romano*; and that he excelled in it beyond all other professors of his age appears from SAGREDO, *Medidas del Romano* (i. e. Vitruvius), of which work the first and rare edition appeared in 1526. 66.

ANDIRA INERMIS, Angelyn or Turkey wood, is a lofty tree forming a strong, hard, durable wood of the East Indies and Cuba (*yaba*). It is also called the Cabbage tree. 13, 71.

ANDIRON, ANDIRNE, ANDYORONE, AUNDHYRYN, HAWNDIRYNE, HAWNDYRNE, or HANDIRON (It. *alare*; Fr. *chenet*; Ger. *brandbock*, *feuerbock*, *feuerhund*). These are the old terms for what is now called a fire-dog; it consisted of an upright standard with one end of a bar of iron fixed at right angles to it, and the other end turned down and resting on the floor; sometimes the head and forepart of the standard were made of copper, and, after the reign of Edward VI, of silver. Thus in *Cymbeline*, act ii, scene 4, SHAKSPEARE says:

— "Her andirons
(I had forgot them) were two winking Cupids
Of silver, each on one foot standing, nicely
Depending on their brands."

A note in the edition of TYAS, 8vo., Lond., 1843, says that the transverse or horizontal pieces upon which the wood was supported, were what Shakspeare here calls the *brands*, properly *brandirons*. Upon these the Cupids which formed the standard "nicely depended", seeming to stand upon one foot. The andirons appear to have been often used in pairs (Ger. *ein doppelter feuerbock*); there sometimes was a standard at each end of the *brandiron*. Few, if any, examples are known which are much anterior or posterior to the year 1600. In France, they seem to have been gilt and enamelled. HUNT (J. F.), *Exemplars of Tudor Architecture*, 4to., London, 1830.

ANDOMETUNUM in France, the ancient name of LANGRES.

ANDRA, see ANDRON.

ANDRACHNE APETALA and TRIFOLIATA (*uriam*) are native woods of Gualpara, East Indies, used for furniture. 71.

ANDRADE (FERNAN PEREZ DE), see PEREZ DE ANDRADE.

ANDRASI (IPPOLITO) of Mantua, is mentioned under the date 1599, by FRANCHETTI, *Storia del Duomo*, 4to., Milan, 1821, as one of the architects engaged on the cathedral at Milan.

ANDREA (JUAN), see ANDRES.

ANDREA DA FIESOLE, see FIESOLE (ANDREA DA).

ANDREA DA PISA, see PISA (ANDREA DA).

ANDREA DA CIONE, see ORCAGNA.

ANDREA RODI (JUAN), see RODI.

ANDREO (PEDRO) was maestro mazonero, or architect to the Queen of Navarre, in 1348, and directed, in that year, the works of the castle of Estella. 66.

ANDRES, or ANDREA (JUAN), of Cuenca, maestro mayor of certain works at Alcala de Henares, was appointed, in 1588, by the chapter of Salamanca to examine and report upon the plans, elevations, and models, for the works then proposed to be done to their cathedral. 66.

ANDREW'S (SAINT), a city in the county of Fife in Scotland. It is pleasantly situated on a lofty peninsula formed by a bay of the sea and the Kinness Burn, a small stream which skirts the town on the southern and eastern sides. This city was an episcopal see in 518, and in 1466 it was erected into an archbishopric by Pope Sixtus IV. King David I made it a royal burgh in 1140, and the charter of King Malcolm II (1004-1034) is exhibited in the Town House along with the silver keys of the city, etc. The houses are of stone, well built, and generally three stories high, in lanes or "wynds", as they were formerly called, and streets, which are not very regular, with the exception of the three principal streets which converge to the extremity of the peninsula; one called South Street, is remarkably fine, broad, well paved, and about three-fourths of a mile long; several new streets and terraces have been recently erected. The castle was founded by bishop Roger about the year 1200, but was nearly demolished in 1337; bishop Trail repaired it at the end of the fourteenth century, when it became the episcopal residence; and was repaired and enlarged by cardinal Beaton in 1546. A year after his death it was demolished, pursuant to an act of council, but rebuilt by archbishop Hamilton in 1553. In 1654 the town council sold "the sleatts, timmer, redd, and lumps", to procure money for the reparation of the pier; the front and arched gateway are the principal parts remaining. The dungeon, cut out of the solid rock to the depth of 27 feet, 7 feet in diameter at top, and 17 feet at bottom, is still shown.

The cathedral was founded in 1159 by Arnold, nineteenth bishop; bishop William Wishart, or Wiseheart, built the west end in 1268-1279, and bishop William de Lambyston, or Lamberton, 1297-1328, completed the edifice, which was consecrated July 5, 1318, and destroyed by the Reformers in 1559. It was 358 feet long inside the walls; the nave 62 feet broad, 200 feet long, with two aisles; the transepts, with an eastern aisle, were 160 feet long; the choir, with two aisles, was 98 feet long, and the Lady chapel 33 feet long. The eastern gable with two towers, each 100 feet high, one tower of the west gable, and parts of the south wall of the nave, and of the west wall of the south transept, are still standing. One of the many interesting ruins remaining is the chapel of S. Regulus, or S. Rule, it is 35 feet 6 inches long by 25 feet wide; the walls still remain; at the west end is a tower 20 feet square and 108 feet high; the date of the building has been assigned to the middle of the ninth century. The great Augustine priory of S. Andrew was erected about 1120; its grounds, comprising about eighteen acres, and containing the cathedral, the chapel of S. Regulus, and some ruins of the priory, were enclosed by prior Hepburn in the beginning of the sixteenth century with a stone wall, 4 feet thick, 22 feet high, and about a mile long, with thirteen round and square turrets at intervals. Three arched gateways are still standing, the handsomest, called the "Pends", is at the end of South Street. The ruin of the Dominican abbey, founded by bishop Wishart in 1274, is opposite the Madras College. There are at present eight places of religious worship. The University, founded in 1410 by bishop Wardlaw, formerly consisted of three colleges, viz., S. Mary's, afterwards called New College; S. Salvator's, founded in 1455 by bishop Kennedy; and S. Leonard's, founded by prior Hepburn in 1512: the two last were joined together in 1747 under the name of the united colleges of S. Andrew's. The buildings of S. Mary's College appear to have been begun about 1538; they form two sides of a quadrangle, and were extensively repaired, along with the University, library, and the principal's official house adjoining, in the year 1829, at an expense of £5,000. S. Salvator's College forms two sides of a square, the east wing being completed in 1831 from designs by — Reid, the king's architect for Scotland, at a cost of about £10,000; the stones being obtained from the neighbourhood of Glasgow. The north wing was built in 1844, at an expense of £6,000, from the plan of the late — Nixon, architect to Her Majesty's commissioners of woods, etc., of a very fine freestone from the bog quarry of Strathkinness, four miles from S. Andrews.

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In its chapel, which enters from North Street, is the rich but mutilated tomb of bishop Kennedy, erected at an expense of £10,000 of modern money; the steeple, repaired and heightened in 1852, is 160 feet high. The buildings of S. Leonard's College were converted into private dwellings soon after 1747; the chapel is in ruins. The library of the University now contains 60,000 volumes. Madras College, endowed by Dr. Bell, a native of the city, with £45,000, for both sexes, was founded in the year 1832, and erected from the designs of William Burn, architect, at an expense of about £18,000 including the teacher's house; it forms a handsome school in South Street. The Madras Infant School was erected in 1844 from plans by Mr. Nixon, at an expense of £800. LYON, *History of S. Andrew's, etc.*, 8vo. Edinburgh, 1843. BILLINGS, *The Baronial, etc., Antiq. of Scotland*, 4to., Lond., 1852; SLEZER, *Theatrum Scotiae*, fol., Lond., 1693. ROGERS, *Hist. of S. Andrew's*, 8vo., Edinb., 1843. FLETCHER, *Guide to S. Andrew's*, 8vo., 1853. The celebrated Bell Rock lighthouse is built on a rock in S. Andrew's Bay, at the distance of sixteen miles from the city. STEVENSON, *Bell Rock Lighthouse*, 4to., Edinb., 1824. J. P.

ANDRI (the ancient ANDRIA). An episcopal see of the province of Terra di Bari, in the kingdom of Naples. It possesses a superb cathedral, founded in 1046, and dedicated to the Virgin and S. Andrea Apostolo; seven monasteries, a college, and an hospital.

ANDRON, ANDRONITIS, ANDRONEUM, ANDRONA, ANDRION, ANDRA (Ger. *männergemach*). The suite of apartments, opening into and including an AULA, which were occupied exclusively by the male sex in the antique Greek houses. VITRUVIUS, vi, 7; SEXTUS POMPEIUS. In Homeric times, it seems to have been placed upon the ground floor, whilst the GYNÆCEUM, or women's apartments, were above it. The term has been explained by FESTUS as a place of public resort for commercial intercourse, like the modern *bourse*; by PAPIAS, as the place of junction of several roads, and also as an alley, an explanation which is supported by the word having been used in that sense at Padua until the sixteenth century, and by the early French word *androune* meaning a narrow way. JOANNES DE JANUA explains the term as signifying the male side of a habitation, and also the space (AMBITUS) between two houses; DUCANGE, s. v. quotes a description of boundaries to the same effect; some colour is given to this opinion by a passage in VITRUVIUS, vi, 10, who clearly uses the word andron for a passage (*mesaula*) betwixt two aulæ, and adds that this use of the term does not answer to either the Greek word ἀνδρῶν, or the term ἀνδρῶνιτις, to both which the commencement of this article applies; PLINY, Ep. ii, 17-22, uses the word for the passage between a house and its garden wall; in the early Christian churches the south side, which was occupied by the male sex only, was thus called; and the ACADEMIA DELLA CRUSCA has explained the word to mean the space between the outer gate and the cortile or the staircase of a house.

ANDRONA. Latrinæ ipsæ subdiales quas andronas dicere possumus.

ANDROUET DU CERCEAU (JACQUES), see CERCEAU (J. A. DU).

ANDUETIUM, in Austria, the ancient name for PRESBURG.

ANEMOGRAPH (Fr. *anemographe*; Ger. *windbeschreiber*). An instrument combining the properties of the ANEMOMETER (Fr. *anémomètre*; Ger. *windmesser*) for measuring the velocity or force of the wind, with those of the ANEMOSCOPE. A description of the instruments which have been used for this purpose including that invented by Mr. Osler in 1837, is given s. v. in the PENNY MAGAZINE, 8vo. London, 1841, p. 462. Several improvements have been made since that time in the apparatus, which now consists of a sheet of plain paper placed under a registering pencil, and moved forward by revolving hemispherical fans at the rate of one inch for ten inches of air that pass; the same pencil, having a lateral motion given to it by a vane, records the point of the compass from which the wind

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Blows; while a clock hammer, descending at fixed intervals strikes a mark on the margin of the paper to express the time. Probably the most complete apparatus of the kind is that belonging to the society of Lloyd's, in the Royal Exchange in London. **AERODYNAMICS.** **WIND.** W. H.

ANEMOSCOPE (Fr. *anemoscope*; Ger. *windzeiger*). Any contrivance for showing the direction of the wind; but the title is usually given to a machine, sometimes self-registering, which supplies this information by means of an index moving upon an upright circular plate, sometimes called a wind-dial; the index is turned by an horizontal axis dependent upon a vertical rod connected with a vane. Both this and the instrument above described are used in club and commercial rooms, where they require much care to render them ornamental features. W. H.

ANEQUIN DE BRUXELAS, see **EGAS (ANEQUIN DE)**.

ANGE (MARCEL OR MARTEL). A Jesuit of Lyons executed in 1588 the church of the Noviciate of the Jesuits in the rue Pot-de-Fer at Paris, and successfully competed, in 1627, with Derrand for the erection of the church of the professed monks of the same order, in the rue S. Antoine in that city. 75.

ANGEL. An ornament introduced into the decoration of the temples of different sections of the Christian church, and apparently derived from the seraphim, **ISAIAH** vi, and not from the cherubim, **EZEKIEL** xli, which were placed over the ark of the Israelites, and are still used in the synagogues. They have been divided into nine classes, which, with their emblems, are given in **PUGIN, Glossary**, s. v. The whole-length human figure, dressed in a white alb with wings of gold, or of a bright red colour and standing on wheels (in reference to the vision of **EZEKIEL**), is to be seen; but in the fifteenth and sixteenth centuries such figures are generally habited in ecclesiastical vestments diapered with jewels; examples, however, feathered all over like birds, were not uncommon at the end of the fifteenth century, of which **PUGIN, Glossary**, enumerates those at Tattershall church, in Lincolnshire; at Wells church, in Norfolk; and in the Beauchamp chapel, at Warwick. Angels are one of the few sculptured objects admissible on the iconostasis of the modern Greek church. The figure of an angel was frequently employed in architecture to support the head of an effigy on a monument, to hold candelabra on shafts and beams, to uphold pulpits, and to bear labels or emblems, or (in late mediæval designs) shields of arms in spandrels or panels; angels were also used as corbels, carrying the stanchions or upright posts of hammer beam roofs and the trusses of arched ribs, and as bosses; the head or bust, either alone, or with the wings, has also been applied to most of these uses. Since the fifteenth century the figure and the bust have been commonly used, especially with musical instruments, as ornaments of organ screens, see illustration **ORGAN**; those so employed in the cathedral of S. Paul at London are considered very effective. The seraph's head singly or in groups was a favourite bracket from 1650 to 1800.

ANGELI (JACOPO PIERO). A painter and architect of Siena, who flourished in the beginning of the fifteenth century. **LETTERE SANESE**, ii, 163.

ANGELLY wood, see **ARTOCARPUS**. 71. 59.

ANGELO (....), called **IL SICILIANO**, designed the portico of the church of S. Celso at Milan (now destroyed). 5.

ANGELO and **AGOSTINO**, see **SIENA**.

ANGELO DE' LOMBARDI (SAN). A city of the province of Principato Ultra, in the kingdom of Naples. It was nearly destroyed by an earthquake in 1664, but still possesses a cathedral dedicated to S. Antonino Martiro, two churches, a college, and a monastery. 50.

ANGELO (STEFANO DI), is mentioned as master of the works at Orvieto from 1501 to 1508. **DELLA VALLE, Storia del Duomo**, 4to., Roma, 1791.

ANGERS (the Roman **JULIOMAGUS**, in late Latin **Andegavia**). A large and important city of the department of the Maine-et-Loire in France, and formerly the capital of the province of Anjou. It stands on a steep hill above the river Maine or

Mayenne, which divides the city proper, or high and low town on the left bank, from a large suburb called the Doutre. In the old portions the streets are narrow, crooked, and in some cases so steep as to be inaccessible for carriages, while the houses generally are of wood; from this circumstance, and from the shade produced by the number of open galleries and projecting roofs, as well as from the employment of slate, which, besides being the common roofing material, is used in plates to cover portions of the walls, or in solid blocks to construct walls, the city is sometimes called "la ville noire"; the more modern parts of the city however are regularly and well built, of a beautiful white stone. Few French towns possess so many interesting ancient churches and houses. The castle, commenced by Philip Augustus (1180-1223), and finished by Louis IX (1226-1270), consists of an immense parallelogram, with walls of great height and thickness, strengthened by eighteen large and massive circular towers, about 75 feet high, which, being less in diameter in the middle than at top and bottom, and built of slate striped horizontally with bands of white stone, have a very singular effect. The chapel, now used as the armoury, and the palace, now in ruins, both within the castle, were built by René of Anjou in the fifteenth century, and are much more modern than the rest of the building. The castle is now used as a prison, barrack, and powder magazine.

The cathedral, dedicated to S. Maurice, is built, according to **BOURASSÉ, Cathédrales de la France**, 8vo., Tours, 1843, in the style *Romano-Byzantine* as far as regards the lower part of the walls, which dates from the eleventh century; the rest is transitional in style, and was finished in 1240. It stands on an eminence in the middle of the town, and is surmounted by two spires, each 225 feet high; the nave is one of the largest in France, being 53 feet wide, 110 feet high, and inclusive of the choir the length is 300 feet; there is no triforium, clerestory, or aisle, but there are two transepts vaulted with stone, each 40 feet long, and 80 feet high; the vividly tinted glass of the windows, as ancient as the building itself, and some remarkable tapestry, rival in interest the internal architecture of the church, which also possesses a *bénitier* of verd-antico marble, supported upon lions, a Byzantine work of the Lower Empire, brought from the East by King René. The other interesting buildings are the Norman remains of the church and convent of S. Aubin, on the site now occupied by the préfecture, partly shown by **SONMERARD, Album des Arts**, 4th series, pl. 1, the stately tower—in the style *ogivale première*—has a modern conical roof of slate, and has been converted into a shot factory; the church of All Saints, also of the last mentioned period; the church of S. Martin (given in vol. ii of **GAILLHABAUD, Architecture, etc.**, 4to. Paris, 1852), of which the nave and transept appear to be portions of the structure originally built by Queen Hermengarda (who died in 819), and restored in 1020, while the choir is of the twelfth century; the church of S. Serge, with a square lady chapel, containing portions of all styles from the *Romanesque* to the *Renaissance*, with a splendidly carved wooden circular staircase; the church of the Holy Trinity, in the style *Romanesque*, built 1063, with a very elegant tower, and altogether one of the finest edifices in France: the equally ancient église de Ronceray, which has been converted into the chapel of the *école des arts et métiers*; the hospital of S. John, which has an extensive hall now used as a ward, with a double row of lofty columns supporting the pointed groined roof; a chapel remaining as it was left by King John of England, and a barn of Norman architecture; several convents; with the remains of similar establishments destroyed at the end of the eighteenth century, and the ruins of a mediæval bridge. The amphitheatre has almost disappeared.

In Anjou private houses, however magnificent, were formerly called "*logis*"; the *logis Barraud* at Angers was built in the fifteenth century by Oliver Barraud, treasurer of Bretagne; it was afterwards the residence of Marie de Medicis, but converted into a *seminarium*, and received additions under

Louis XIV; it is now appropriated to the public service, and contains the museum, the collection of natural history, and the public library of 26,000 volumes and some curious manuscripts; the cloister is an interesting example of late Gothic work, as is also the winding staircase, situated in an angle of the same courtyard, illustrated in fig. 2, pl. xxxvi, STAIRCASE. The plan is octagonal in the lower story, carried into a square at the second floor by means of a long straight corbel, commencing in a point at bottom, and covered with small knots of foliage. Among other private houses one in the rue Baudrière, one in the rue du Figuier, and a corner house in the *place* behind the cathedral are worthy of observation.

The city also possesses an Hôtel de Ville, founded 1155, by Henry II of England, and formerly the residence of the Counts of Anjou; a picture gallery of modern French works, a *cour royale*, préfecture, etc., an *académie* or college, a *college royale* or high school, a *séminaire* for theological instruction, two other schools, an asylum for the deaf and dumb, a cavalry barrack formerly the *académie d'équitation*, two theatres, a bank, five hospitals, and a botanical garden.

In the neighbourhood are extensive slate quarries, which give employment to about 3,000 men, and furnish about 80 millions of slates per annum. It also contains two splendid châteaux: that called *du Verger*, begun in 1499, built of *regeasse*, a kind of stone as fine and nearly as hard as alabaster, but much whiter, was nearly demolished in 1780; the other, called *de Serrant*, is a medley of various styles and masses of buildings raised during the last three centuries, appearing, however, both picturesque and imposing; the front opposite to the Loire, is flanked by two round towers, crowned with entablatures and domical roofs; the principal front faces the road to Nantes, and is placed between two grand wings, which form the *cour d'honneur*. Napoleon I, at his visit in 1808, observed that he saw at last a château in France the architecture of which reminded him of Italy. 28.

BOURDIGNÉ (J. DE), *Histoire aggrégative des Annales et Chroniques d'Anjou*, folio, Angers, 1529; HIRET (J.), *Antiquitez d'Anjou*, 12mo., Angers, 1609; MOTHREY, *Recherches hist. sur la Ville d'Angers*, 4to., Paris, 1776; BODIN (J. F.), *Recherches hist. sur l'Anjou et ses Monuments*, 2 vols. 8vo., Saumur, 1821; MÉRIMÉE (P.), *Notes d'un Voyage dans l'Ouest de la France*, 8vo., Paris, 1836; GODARD-FAULTRIER et HAWKE, *L'Anjou et ses Monuments*, 3 vols., 4to., Angers, 1839; DE CAUMONT, *Cours d'Antiquités monumentales*, 4 part. and atlas, 8vo., Paris, 1841; BATISSIER (L.), *Éléments d'Archéologie nationale*, 18mo., Paris, 1843. W. H.

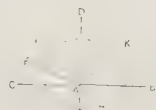
ANGICA wood, a native of the Brazils, is used for cabinet work and turnery. 71.

ANGIOLINI (GAETANO), a Jesuit, accompanied his brother Francesco to Russia, and built the Roman Catholic church at Witepsk. He is mentioned by TIPALDI as being active in Italy in 1804.

ANGIOLO, ANGELO, or AGNOLO (FRANCESCO D'), commonly called CECCA, was made, in 1482, capo-maestro of the church of S. Giovanni at Florence as a reward for his ingenious design and construction of a scaffolding for cleansing and restoring the mosaic in the tribune of that edifice. He died in 1488, and was commemorated by an inscription destroyed in 1561, but recorded by VASARI.

ANGIORTUS, or ANGIORTUM (Gr. *στενωπός*). The ancient term for a small back street, sometimes used for *fundula*, a court with no thoroughfare.

ANGLE (It. *angolo*; Sp. *rincon*; Fr. *angle*; Ger. *winkel*). The aperture at the junction of two lines or planes of indefinite length meeting in a point, VERTEX, or line of concourse; the two boundaries are called legs. MITRE. The measure of an angle FAC whereby its quantity is expressed, is an arc GH described from its vertex A, with any radius taken at plea-



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sure between its legs AF and AC; and thus an angle is said to be of so many degrees, as are the degrees of the arc GH. The least angle visible to the naked eye is perhaps 20°.

ANGLE BAR. The corner upright bar of a polygonal sash.

ANGLE BEAD. A beaded ANGLE STAFF, consisting of a single bead at the corner of joiner's work; the word is also used for an upright finish at the external angle of, and flush with, plasterer's work, for which the old and correct term was STAFF BEAD.

ANGLE BRACE. This term is usually explained as being the same as a dragging or DRAGON piece, or DIAGONAL TIE, or ANGLE TIE; but the proper application of the word is to a piece of timber fixed on two sides of a quadrangular frame to assist in forming the area of the opening into an octagon as A; by a repetition of which process other polygonal plans are formed.



ANGLE BRACKET. A BRACKET placed at the vertex of an angle, and not at right angles with either side. 1, 2.

ANGLE CAPITAL. The Ionic capital in Greek architecture put on the angle column of a portico, and having two neighbouring volutes placed at an angle of 135° with the plane of the front. HORN. An example from the triple temple on the Acropolis at Athens is in the collection at the British Museum, and presents a curious instance of patchwork on the part of the ancient masons to remedy some defect in the marble. This variation from the usual form of capital is not explained by the usual assertion that the volute was so placed in order to correspond with other capitals of columns on the flank of a building, inasmuch as the angle capital is found in the temple on the Ilissus at Athens, which had no columns in flank. ANGULAR CAPITAL. 2.

ANGLE CHIMNEY. A chimney placed at an angle of an apartment, so that the breast forms an obtuse angle with each neighbouring side wall; for the construction of which sort of chimneys there are particular regulations in the metropolitan buildings act.

ANGLE COLUMN (Fr. *colonne angulaire*). A column placed at the corner of a building, whether the column be isolated or engaged, and whether the angle so flanked be external or internal, acute or obtuse. 5.

ANGLE FLOAT. A FLOAT used in plastering, and made to suit any angle formed by the sides, etc., of a room. 23.

ANGLE IRON. A piece of iron rolled in the shape of the letter L, which is employed to make the joints of boiler-plate work, by being riveted to one plate on each outer face, as at A.



ANGLE JOINTS or MITRES, see MITRES.

ANGLE MODILLION. A modillion placed at the outer angle of a return cornice, a practice at variance with the purer known examples of antiquity, but which was introduced in later periods of the Roman empire with the view to assist in supporting the immense blocks of greatly overhanging cornices, and to avoid the vacant space which occurred at the angles of modillioned or bracketed entablatures, as illustrated by WOOD and DAWKINS, *Baalbec and Palmyra*, folio, London, 1753 and 1757; and by CASSAS, *Voyage pittoresque de la Syrie*, etc., fol., 1798. T. L. D.

ANGLE OF A WALL. This term is often used by workmen for the arris, line, or point of meeting of the planes or lines of two sides, as of an apartment; but the explanation given s. v. ANGLE, states it to be the angle contained within the two lines or planes. 1.

ANGLE OF ELEVATION, sometimes improperly called angle of inclination. The lesser angle, FAC, comprehended between the line of direction of a raking piece, FA, and the horizontal plane, AC, from which it starts; if that plane be not horizontal, as LF, the angle is measured on the side against which the raking piece would fall; such are the angles LAB, LAK, LAD, PAD, PAI. The letters refer to the illustration, ANGLE.

ANGLE OF INCIDENCE. The lesser angle, IAF, IAC,

made by the line of direction of an impinging body, *IA*, with the plane on which it may fall, as *LF* or *BC*.

ANGLE OF INCLINATION. The lesser angle, *IA*, *D*, comprehended between the line of direction of a raking piece, *IA*, and the vertical plane, *ED*, from which it starts.

ANGLE OF INCLINATION OF AN INCIDENT RAY. The angle *IA*, *D*, which a ray of light, *IA*, makes with a perpendicular *DE* to that point of the surface of any medium, *BC*, on which it falls.

ANGLE OF INCLINATION OF A REFLECTED RAY. The angle *KAD*, which a ray of reflected light, *AK*, makes with a perpendicular *DE* to that point of the surface of any medium, *BC*, from which it is reflected.

ANGLE OF INTERVAL between two places, in perspective, is the angle, *DAC*, included between two lines, *DA*, *CA*, drawn from those places, *D* and *C*, to the eye *A*.

ANGLE OF REFLECTION. The lesser angle, *KAB*, *KAL*, which a ray of light, *AK*, *AL*, makes with the plane, *BC* or *LF*, from which it is reflected. The angle of reflection is always equal to the angle of incidence.

ANGLE OF VISION, OR OF VIEW. The angle included between two planes proceeding from the point of sight to the extremities of the extent of the view to be represented, in a perspective drawing: this angle will be either large or small in proportion to the proximity of the eye to the object. It has been brought within certain limits by the axiom that the view should on no account comprise a greater extent than can be seen without moving the eyes or head. It has been laid down as a rule that the greatest distance of the eye from the picture should not exceed the width of the picture laterally, which makes the angle of vision to comprise about 53° : a much larger angle has been allowed in particular circumstances, but in practice an angle of from 45° to 60° is generally adopted. Others consider that the angle of vision for a picture should not exceed 30° , as objects beyond that angle become distorted; in any case the point of sight properly should be placed at such a distance as to embrace the whole of the view of objects seen or to be represented. The term **VISUAL ANGLE** is used when height, and not width, is under consideration.

ANGLE PIECE (Fr. *pièce d'angle*). The portion of the plane of a floor, wall, or soffit fitting into a corner. 5.

ANGLE RAFTER. This term is usually misinterpreted as meaning a **HIP RAFTER**, whereas it is properly a principal rafter placed below the hip rafter, and supporting the ends of the purlins under the hip.

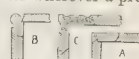
ANGLE RIB. The very equivocal explanations which are usually given of this term would seem to allow its application either to a hip-rib in coved vaulting, or to a groin-rib in cross vaulting. It is, however, a piece of iron or timber, *A*, straight or curved, as the ceiling may require, corresponding with the common ribs, *B*, when they are fixed in a vertical direction, and serving to support or receive such timbers, *C*, as are placed at those parts of a ceiling wherever two planes form an angle.

ANGLESEA MARBLE, commonly called **MONA MARBLE**.

ANGLE STAFF. A piece of wood fixed vertically at the exterior angles in apartments, flush with the intended surface of the finished plastering on both sides, for the purpose of securing the angle against accident, and of serving as a guide in floating the plaster. Formerly it was considered a mark of a superior apartment that an angle staff, *A*, and not a **STAFF BEAD**, *B*, should be used; and, in some cases, the staff was carried up to the height of seven feet only, the aris for the additional height being of plaster, but the shrinking and warping of the wood seems to have been found a great defect; and even in later times it has been ruled that, in good finishings, the plaster should be well gauged and brought to its own aris. This, however, seems to be no longer the opinion of the best builders, who, in such cases



as the arched heads of openings have recognized the difficulty of putting angle staves without cutting or steaming them, and as the first alternative produces an unsightly piece of work, while the second is inconvenient and troublesome, it has become the practice to run **ANGLE BEADS**, *B*, in plaster wherever a prejudice in favour of an aris does not exist: in short it may be said that wherever walls are to be painted, angle beads are used to the exclusion of staves. This is a return to the old practice of making the angle staves of much larger dimensions, *C*, than those now in use; they were often made of oak very carefully finished, to represent a rod entwined by a ribbon or leafage, left of their natural colour and varnished, were stained black to imitate ebony, or were gilt. The effect is now often produced by the use of carving leather or gutta-percha ornaments, and by the employment of metal. The term is also applied to a fillet of plastering, sometimes of Martin's or Keene's cements, used for their hardness, run upon the angles of work as a guide for floating the intermediate space, in imitation of the system employed in the use of stucco or cement.

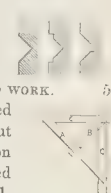


1, 2.

ANGLE STONE (Fr. *pierre du coin*; Ger. *eckstein*). A term used by some authors for a **QUOIN STONE**.

ANGLET (Fr. *anglet*; Ger. *vorsprungswinkel*). A groove, generally containing an angle of 90° , such as that used in the channels which form the separation of the stones in **RUSTICATED WORK**. 5.

ANGLE TIE. This is sometimes explained as being the **DRAGGING** or **DRAGON** piece, *B*; but its real signification is a brace, *A*, supported on each returning wall plate, *C*, on which it is caulked or cocked down. 1.



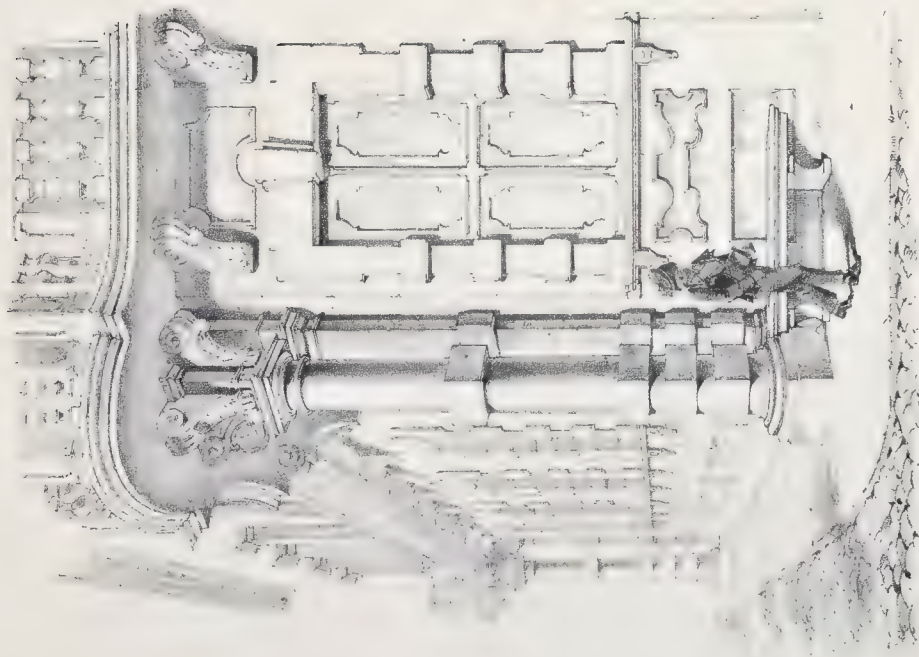
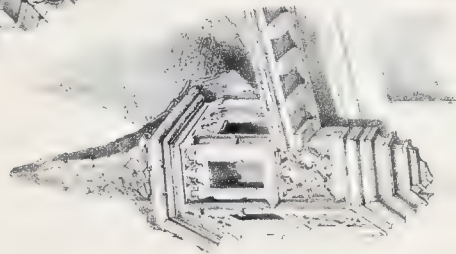
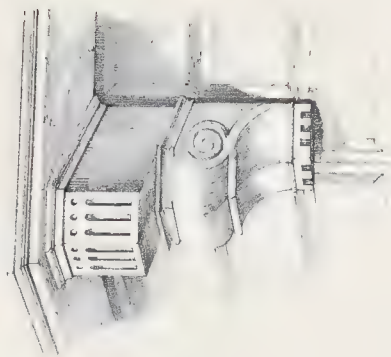
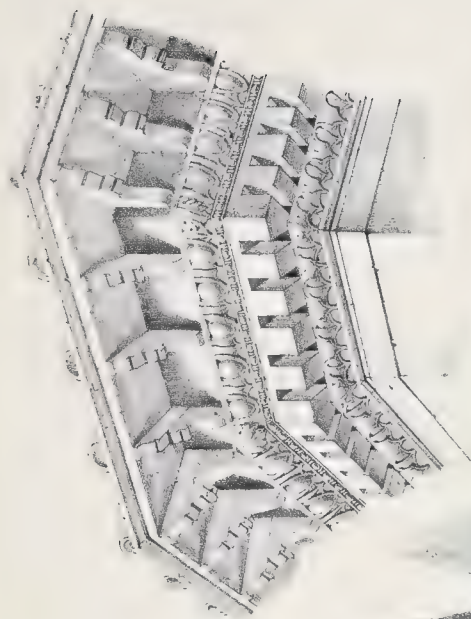
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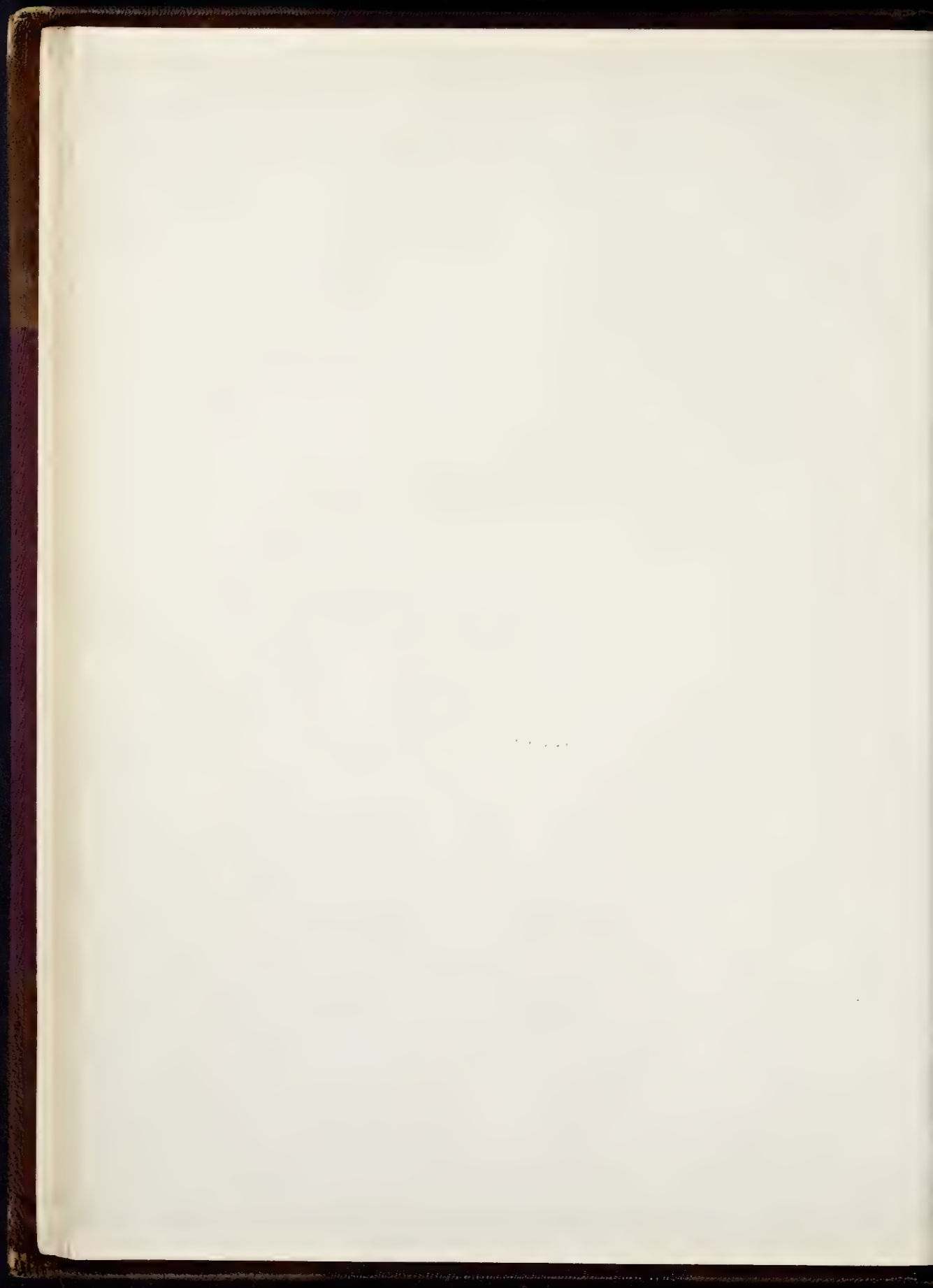
ANGLE TILE. A tile fitting into an angle or corner.

ANGLONA (*AQUILONIA*, *ANGLONA*). A city in the province of the Basilicate in the kingdom of Naples, which was destroyed by the Emperor Frederick II (1212-1250), with the exception of the cathedral church dedicated to the Virgin. The episcopal see was transferred, in 1546, to **TURSI**. 75.

ANGLO-SAXON ARCHITECTURE, sometimes called **SAXON ARCHITECTURE**. This term is applied to buildings in England constructed from the end of the sixth to the beginning of the eleventh centuries (see *Detached Essay*). **RICKMAN**, *An Attempt to discriminate the Styles of English Architecture*, 8vo., Lond., 4th edit. 1835; and 5th edit., 1848. **GLOSSARY of Terms, etc., in Architecture**, 8vo., Lond., 4th edit., 1845. The **ECCLESIOLOGIST** Journal, and the **BUILDER** Journal, passim. **S. TURNER**, *History of the Anglo-Saxons*, 8vo., Lond., 1852. **BLOXAM**, *Principles*, 12mo., Lond., 1845, 9th edit.

ANGORA, or **ENGOUR** (the ancient **ANCYRA**). A once important city of the province of Galatia in Asia Minor, but now surrounded by old ruinous walls with a dilapidated castle. The modern town is divided into eighty-four districts, each having its mosque or *djameh*. It also possesses seventeen khans, three public baths, and a market-place, the ruins of which prove it to have been a fine structure. The most famous antique edifice was the Augusteum, or hexastyle peripteral temple, built in honour of Augustus and Rome: only three walls of the cella remain; the capitals of the ante are formed of winged figures of Victory standing amid foliage. There are only two temple doorways mentioned as remaining perfect in Italy; and **TEXIER** (*Descr. de l'Asie mineure*, fol., Paris, 1838) considers that they are not to be compared to that of the Augusteum; the door itself was transported as a trophy to Bagdad, by Haroun al Raschid, about the same time that Mahmoud Ghusnevide removed the gates from Somnauth to Cabul. **TEXIER**, pl. 64, 65, illustrates the present condition of the edifice, with a remarkable minaret; three sections, the naos being an almost unique example of an unutilized interior of an antique temple; two plates of the elegant details, the remarkable Persico-Byzantine column with a shaft 3 feet 8 inches diameter, and 30 feet high between the cap and the base, dating about the fourth century,





and supposed to have been erected in honour of the emperor Julian or Jovian; and the very interesting basilica called the church of S. Clement; are also given by the same author. The streets, which are wide and paved with blocks of granite, exhibit many models of art in pieces of Roman sculpture: these fragments are worked into the walls of the houses, which are generally two stories high, of wood and brickwork, with projecting verandahs. The old aqueduct, composed of stone pipes, and also the new one, are described page 4 of *AQUEDUCT*.

ANGOSTURA. The capital of the republic of Venezuela in South America. The streets are regular, well paved, and lined with houses chiefly built of stone, having terraces for their roofs. The city contains a college, an hospital, and a hall of Congress, which is highly praised. 50.

ANGOULEME (ECOLISMA, ENGOLISMA, ICULISMA, of the Romans). The ancient capital of the province of Angoumois, and now of the department of the Charente, in France. The ancient houses upon each side of the river Charente, which is here crossed by a handsome bridge, form ill-built, narrow, and crooked streets; but the *Quartier neuf*, built of a white and easily-worked stone, contains many regular, wide streets with well-constructed edifices. The cathedral, dedicated to S. Pierre, is described by *BOURASSE, Cathédrales de la France*, 8vo., Tours, 1843, as being of the *style byzantin*, so far as regards the entrance front, pillars, and central octagonal tower; he dates the vaulting of the nave (in three domes) and of the choir, from the restoration of the interior (1628?); there are no aisles to the nave, but those to the choir, which ends in an apse, are of the *style ogival secondaire*. The church was rebuilt from the foundations in 1120, having at the extremity of the north transept a fine and tall tower with six ranges of semicircular arcades. The castle, now used as a prison, with its three picturesque turrets and a tall donjon, stands in the market-place, in the centre of the city. The other old buildings are the church of S. Andrew, and the chapel of S. Gelais. The modern public structures are, the *palais de Justice*, in the attic story of which is placed the public library, with a small collection of objects of national history; and the column erected in 1816 in honour of the Duchesse d'Angoulême, but dedicated in 1830 to Liberty. The buildings of the Royal Naval School, established in 1816, but transferred in 1830 to Brest, are occupied by the *collège royal*, or high school. The city also contains hospitals, a lunatic asylum, a house of detention, and a work-house.

LA BORDE, Monuments de la France, etc., vol. ii, pl. 129, 130; **HUGO, France, monumentale et historique**, 8vo., vol. iii, pl. 11; **GODWIN, Sketches in Poitiers and Angoulême**, 12mo., Lond., 1842.

ANGRA. The capital of the island of Terceira in the Azores. The city was made an episcopal see in 1534, and contains a castle; a cathedral dedicated to S. Salvador; five parish churches; eight monasteries and convents; and an arsenal.

ANGSANAH, ANGENA, or SENNA BAYMAH, is a wood of Singapore and Prince of Wales Island, used for furniture. 71.

ANGULAR CAPITAL. A term used in descriptions of some varieties of the Ionic order, to express a capital which has four sides alike, showing the volutes placed at an angle of 135° on all the faces. The invention of this capital is generally attributed to Scamozzi, who might have taken the idea from the example of an *ANGLE CAPITAL* in the temple to Fortuna Virilis at Rome: but such a capital is described as existing in the Museum of Antiquities at Brescia. An arrangement of three faces alike, exists in the internal order of the temple to Apollo at Bassæ, where each face consists of a concave ornament, as may be seen executed at Oxford and elsewhere by Mr. C. R. Cockercell, R.A. Another arrangement exists in the temple to Vespasian, commonly called the temple to Concord, at Rome, where the volutes appear affixed to the caps, which has been reproduced in the interior of the church



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of S. George, Hanover-square, London. These seem to be the only antique examples which have as yet been noticed. W.H.

ANGULAR COLUMN (Fr. *colonne angulaire*; Ger. *ecksäule*). An isolated column placed in the corner of a portico, or inserted at the corner of a building; or even a column that flanks an angle, either acute or obtuse, of a figure of many sides. 13.

ANGULAR NICHE. A niche formed in the corner of a building, whether internal or external. Examples of the last kind are most common in medieval architecture. A singular and elegant instance of a window in such a position externally occurs in the church of S. Petronio at Bologna.

ANGULAR PERSPECTIVE. A term applied to that division of perspective in which horizontal lines of the front and side of any building respectively converge to their vanishing points in the horizontal line of the picture. It is sometimes called oblique perspective, and is used in contradistinction to *PARALLEL PERSPECTIVE*, in which only the lines of the side of any building converge to the vanishing point.

ANHULWARRA PUTTUN, in India, see *NEHRWALEH*.

ANI, ANISI, or ANNI (the ancient *DIZACA*). This city was the capital of Armenia from the fifth or sixth centuries, under the Pagratidian princes, but was devastated in 1064 and again in 1386. The ruins have been very fully explored by *TEXIER, Descr. de l'Arménie*, fol., Paris, 1842, from whose labours an extract in the *REVUE GÉNÉRALE*, 1842, p. 102, was published in the *CIVIL ENGINEER, etc., JOURNAL*, 1843, p. 183. From the plan of the locality it appears that the existing walls, in some places from 40 to 50 feet high, have three principal gateways, and that the bastions and curtains are still ornamented with crosses and geometric decorations, in mosaic, of large pieces of black and yellowish coloured stones. The cathedral, having an inscription proving that the first stone was laid in 1010, is 116 ft. 6 ins. long by 77 ft. 6 ins. wide on the bottom plinth of its base, which is formed in three faces: the front and side elevations, 63 ft. high to the main eaves, afford evidence of a Byzantine design carried out by artists who were either natives, or imbued with the feeling prevalent in the ornament of the Mahometan invaders of Europe. The occurrence of a fixed date in reference to the arches, many of which are pointed, is interesting. Another church, 44 ft. 6 ins. long, by 32 feet wide, may be called purely Byzantine; it is interesting from the remains of the *NARTHEX*, of which three disengaged and two engaged columns remain: the same style is observable in a sepulchral chapel, 6 ft. 9 ins. diameter in the clear of its lantern, which stands on a wall pierced by six openings for semicircular niches; the front is a low square building, with arches on columns. *TEXIER* also describes a mosque with minaret, in perfect preservation: the *voussoirs* of the flat-vaulted roof of this last named edifice are so adjusted as to form arabesque geometric designs at the joints. A citadel, with its church, palace, and barracks; another palace, a large tomb, a second polygonal building or baptistery, and five or six other monuments are also mentioned.

The rejection of the spherical cupola, which is replaced by a conical ceiling, a species of construction found in a great number of Arab tombs in Cappadocia; the style of the ornaments; the great delicacy of the detail; the restricted employment of disengaged columns, or even of columns except as piers; the use of exceedingly tall shafts singly, or grouped as in European Gothic edifices; the combination of pointed and horseshoe arches, which is scarcely ever to be found in Christian buildings; the mixture of materials, by courses of different colours, so early as the eleventh century; the absence of any wood or iron work in the edifices; the introduction of covering slabs made of lava, but similar to the ancient Greek marble roof tiles; and the remarkable plans of the niches, which resemble the sections given s. v. *ANGLET*, may be summed up as the chief peculiarities of the buildings in this very remarkable city.

The ruins are also described by *HAMILTON* in the *Transac-*

tions of the Roy. Inst. Brit. Architects, vol. i, part 1, 4to., Lond., 1836; Sir R. K. Porter, *Travels in Persia, etc.*, 4to., Lond., 1821.

ANIMAL. The extreme difficulty of deciding, in most cases, upon the name to be given to the natural or fabulous varieties of the brute creation which have been employed as integral portions of construction, necessitates the treatment of this subject under the article **MONSTER**: it manifestly requires a separate essay to discuss the use which has been made of animals in decoration; and it will be sufficient here to note that the angel, the lion, the bull, and the eagle, have been accepted as the emblems respectively of the evangelists SS. Matthew, Mark, Luke, and John, and are constantly found in the sculptures of medieval buildings.

ANNEALING, or **NEALING**. The process of restoring to bodies, which have become brittle, less tough, or softer, from suddenly cooling after having been cast or blown, that kind of normal arrangement of their particles, which is supposed to have been destroyed by the previous operations. The process consists simply in reheating the articles to be annealed, and allowing them to cool slowly; glass thus becomes less frangible, and some metals, which have become brittle, are again made malleable: in this way cast iron has of late years been rendered malleable without being subjected to the action of puddling, simply by being kept imbedded in ground charcoal for several hours at a temperature little below its fusing point, and then allowed to become cold under graduated changes of temperature. In nearly a similar manner, zinc, when it has been passed between rollers at a moderate increase of heat, becomes almost as flexible and tough as copper, although it would be incapable of extension (except in a very slight degree) under the hammer without cracking.

NEALING or **ANNEALING** is applied, in some statutes, to the burning of tiles.

ANNECY. A city in Savoy, formerly the ancient capital of the Genevois, and distinguished from another town of the same name by the epithet **LE VIEUX**. The episcopal seat was transferred from Geneva to this town in 1535; the cathedral is dedicated to S. Peter. Among the objects of interest are an ancient chateau, the episcopal palace, a church, ten monasteries and convents, a *collège* or school, a public library, an hospital, and the rows of houses built with arcades to form sheltered streets.

ANNES or **ANNEX** (**GIOVANNI**) of Fernach near Freyburg, is mentioned by **FRANCHETTI**, *Storia, etc., del Duomo*, 4to., Milan, 1821, under the date 12 March, 1391, as engaged upon the works at the cathedral of Milan.

ANNI, in Armenia, usually written **ANI**.

ANNICUT. The Hindostanee term for a weir or dam; it is a stoppage built out in a river from a bank, as a pier or break-water, and made use of in the Indian rivers to intercept the current of the stream, and divert a portion of its waters into channels or reservoirs for agricultural purposes. The general construction consists of thin piles of young timber driven into the river at right angles with the bank on one side, and filled with hurdles and mud. It is occasionally constructed of stones laid in regular order; and in the British dominions in India the subjects, owners, and occupiers, are taxed for the use of the annicut, and the impost is payable though the walls may not be kept in repair. A system of supply by this method, both for irrigation and for fishing by weirs, was adopted in Ireland under the Shannon improvement commission, but proved a failure, the expenditure being very great, the tax high, and the system not well understood. W. H.

ANNIEGO (**FERNANDO DE**), finished, in the year 1439, the Benedictine monastery of Sta. Maria at Piasca in Spain, according to the inscription upon the façade. 66.

ANNISY or **ANISY**. A village near Caen in Normandy. The church is remarkable for its herringbone masonry, composed of small flagstones about the size of tiles, it was unquestionably erected by Norman builders, and is supposed to be in

imitation of Roman work. The apertures made for the scaffolding still exist, and are edged with freestone. Other buildings in the locality exhibit similar construction. **COTMAN**, *Arch. Antig. of Normandy*, vol. ii, p. 73, pl. 67, fol. London, 1822.

ANNUITY. The periodical payment of money for a determinate time, or for a period terminable upon a contingency, or for an indefinite term, in which last case it is called a perpetual annuity. An annuity is said to be *in arrear*, when it continues unpaid after it is due, and to be *in reversion* when it is to fall to the expectant at a future time. **VALUATION**.

ANNULAR MOLDING. A term sometimes employed by writers on the Orders, for any molding circular in plan, such as the torus of a base.

ANNULAR VAULT (Fr. *voûte annulaire*; Ger. *ringgewölbe*). A vaulted roof supported upon walls circular on plan. The term is also used for a continuous vault ramping from the newel of a staircase to a wall circular on plan. 5.

ANNULATED COLUMNS. Those columns or clustered columns which are joined by rings or bands; examples are seen in Salisbury Cathedral, the Temple church in London, and many other buildings belonging to the early part of the thirteenth century. The four pillars on each side, westward of the transept (temp. Edward I), in Westminster Abbey church, have brass or bronze bands.

ANNULET (Lat. and It. *armilla*; Sp. *armella*; Fr. *annelet*; Ger. *schmale-leiste*). Any small square member, such as a fillet, which is both circular on plan and detached from any other molding. The term is generally and properly only applied to the three, four, or five fillets under the echinus, and to those in the **HYPOTRACHELIUM**, of the Greek Doric order, and to the similarly detached fillets in antique Greek bases.

ANONA PALUSTRIS (*bagá*). A native wood of Cuba, used in building and for furniture. The species producing the fruit, called cherimoyer, forms a picturesque tree resembling a large bay tree; and the wood of **A. TRILOBA**, the *papaw* tree, the only species seen in the forests of North America, is spongy, soft, and without strength; it grows to about thirty feet in height and from six to eight inches in diameter. 71. 90.

ANSA. The term employed by **VITRUVIUS**, ii, 8, for the **CRAMPS** used for the connexion of large stones in ashlar walling: the existence of this word is one of the arguments against giving a similar explanation to **ANCON**. The term also expresses the handle of a vase as well as of a door, when it is affixed at both ends to the body which it is intended to move.

ANSEDONIA, the modern name for **COSA**.

ANSELM (**SAINT**), see **CANTERBURY** (**ANSELM OF**).

ANSERARIUM (Gr. *χρησβακείον*). The Roman term for the constructions adopted for the shelter and support of the birds belonging to the goose tribe. They consisted of a court surrounded by an extremely high wall, with a portico inside, which contained receptacles from two to three feet square, built of hewn stone or brick, and having a good layer of chaff for the eggs. The modern arrangements are similar; and a piece of good grassy ground should adjoin the court; dark and warm coops for fattening the goslings are also requisite. 78.

ANSPACH, **ANSBACH**, or **ONOLZBACH**. The capital of the circle of the same name in the kingdom of Bavaria. It is chiefly remarkable for a picture gallery and public library, with a handsome staircase, in the otherwise deserted palace, built in 1713 for the margraves of the province. The Orangery, celebrated throughout Germany, is 300 feet long by 30 feet wide and high. The town is laid out with great regularity, and contains many spacious streets and squares, and several fine buildings, as well as three churches, including that of S. Gumbert with three towers; and a synagogue. W. H.

ANSTON (incorrectly written **ANSTANE** or **ANSTONE**). A parish in Yorkshire, in which is the quarry whence the stone of the same name was ultimately selected by the Commission for the rebuilding of the palace at Westminster, as being a durable **DOLOMITE** or magnesian limestone, and hardening by

exposure to the air: its colour is a creamy yellow approaching to white, and varying in depth of tone from the upper to the lower beds. The quarry is situated about eight miles from the house at Bolsover, which were first recommended for adoption. *BUILDER Journal*, vi, 385. W. H.

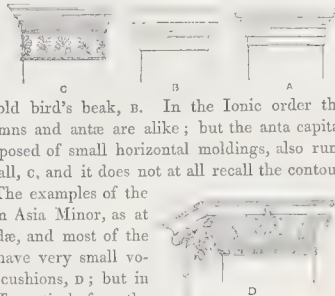
ANT. The annoyance created by the insects which have received this designation arises from two very distinct creatures, one being the *formica fuliginosa* (belonging to the order Hymenoptera), or black carpenter ant or emmet; the other being the *termes* (belonging to the Neuroptera) or white ant, as it is called, although it has little affinity with the true ant, and is chiefly confined to the tropical regions; some species of this latter genus have extended their ravages into the temperate zone; thus some years before 1847 a singular plague of these insects, originally imported from India, infested the wooden buildings of Rochelle: the natives destroy them with quick lime, or more readily with arsenic if it be thrown into the habitations of these insects. They unite in societies, each composed of an immense number of individuals living in the ground and in trees, and often attack the woodwork of houses, in which they form innumerable galleries all leading to a central point, but carefully abstain from piercing the surface of the woodwork, which looks sound when it has really no consistency. In this they very much resemble the *formica fuliginosa* above mentioned, which differs from the *formica fusca* or dusky ant, and from the *formica flava* or yellow ant (all these three are also called carpenter ants), in preferring hard and tough wood; easiness of working it being apparently considered a disadvantage rather than a recommendation. Although in this country there have been no formal complaints of the destruction of timber in houses by these insects, yet many instances are known of trees having been totally destroyed by them. It is remarkable that all the wood which is attacked by the *formica fuliginosa* is tinged of a black colour, supposed to arise from iron in its saliva acting on the gallic acid of the timber. The ant is found to migrate in a manner and at times for which no reason has yet been satisfactorily assigned. Many prescriptions have been given for the destruction of these species; jalap; cajepout oil; quicklime dusted in the track to ascertain the retreats, or if not sufficient in itself, the addition of the ammoniacal liquor of gasworks; and a solution of alum and potash applied boiling hot to the timber are mentioned in the *BUILDER Journal* for the years 1849 and 1850, which adds, that the *MEDICAL TIMES Journal* states that ants are easily dislodged by pouring limewater into their abodes, and as easily poisoned by arsenic, as above mentioned. HILL, on the *Management of Fruit Trees*, says, that their destruction may be effected by watering the walls, etc., with brine, made by adding two ounces of salt to a gallon of water. JOHNSON, *Farmer's Dictionary*, 8vo., Lond., 1842, states that a liquor prepared by boiling rain-water with black-soap and sulphur has been employed with considerable success. The ground requires to be well saturated. All these remedies require the well-known addition of first finding the retreats; and perhaps the only efficient remedy is to catch them in large numbers by means of paper spread with an adhesive mixture, which should be so laid as to intercept the columns of their visible march homewards. The same means may be adopted with the other hymenopterous insects which are not less troublesome as depredators in a store-room.

ANTA (It. *anto*; Sp. *antas*; Fr. *ante*; *pilastre*; Ger. *anten*, *stirnpfeiler*). As used by VITRUVIUS, iii, 1, and iv, 4, and employed in ancient monuments, such as the temples at Agrigentum, Eleusis, and Rhamnus, antæ signify those pillars or pilasters, in Greek buildings, as at γ , produced by giving a slight projection to the ends of the PTEROMATA or side walls of the cella of a temple, which protrude into the pronaos or posticum. The Greek antæ, and their equivalent PILASTERS in Roman architecture, have in common some analogy of position and form, and also



some varieties of ornamentation and application. Pilasters have all the features and properties of columns, except that they are square in plan, and may be placed in any part, against the sides or ends of a wall. The antæ, however, always occupy the ends of the wall, and are not repeated intermediately in the length. Antæ diminish in diameter upwards, but not to the same extent as the columns; perhaps the greatest ratio of diminution is seen at Pæstum. The return faces of antæ are generally much narrower than the face next the corresponding column, and sometimes divided into two or more, as in the tetrastyle portico of the triple Ionic temple in the Acropolis, Athens.

In the Theseum the antæ have a base molding, which is singular, as the Greek Doric column never has a base. Antæ have capitals, the mouldings and parts of which have not necessarily any analogy with those of the columns, and in all known Greek examples vary essentially from them. The character of these capitals differs according to the types of the columns; the Attic type of the Doric, A, consists of a series of small mouldings; those of the Sicilian present a bold bird's beak, B. In the Ionic order the bases of the columns and antæ are alike; but the anta capital of Athens is composed of small horizontal mouldings, also running along the wall, C, and it does not at all recall the contour of the volutes. The examples of the Ionic anta cap in Asia Minor, as at Priene, Branchydæ, and most of the Ionian temples, have very small volutes and return cushions, D; but in other respects differ entirely from the column capital; and a like instance is to be found in the temple to Neptune, near the Forum Nundinarium at Pompeii. T. L. D.



NONIUS calls the anta a square pilaster or column, and SERVIUS, in *Georgic*. ii, 417, explains it as being an outer column. The word is also applied by FESTUS, s. v., to the sides (not the dressings) of doorways. The term is used by VITRUVIUS, in vi, 11, but the context does not clearly identify the meaning of it; in vi, 10, the sense seems to justify the present usual acceptance, which agrees in this instance with the explanations given by the three beforementioned etymologists; in iv, 4, it is evident that this author means a square pilaster with three visible faces; and in iii, 1, and iv, 7, he specifies *angular* antæ, as at the angle χ in the plan. Some architects have restricted the use of the term to square pillars which have neither base, capital, nor any other molding: while the French architects have applied it to the massive piers at the corners of Egyptian temples. In ANTIS. PARASTATA.

ANTEOPOLIS, or ANTÆUM (probably in later times *Antova*, but called by the French *Gâou el Kebyreh*, and by Wilkinson *Gow el Kebîr*). A city on the east bank of the Nile near Osioot, in Egypt. The last remaining pillar, 7 feet 7½ inches in diameter and 37 feet 9 inches high, including the capital and base, of the principal temple, with its propylon or pronaos of eighteen columns, as shown in the *Description de l'Égypte*, fol., Paris, 1822, Pl. iv, 38, was undermined by the river in 1821. The name of Ptolemy Philopator occurs on many fragments. The pronaos was erected by Ptolemy Philometor, and the roof repaired by the Aurelii, Antoninus and Verus, according to inscriptions which were visible during the French campaign in Egypt. The building was interesting on account of the dwarf walls between all the front columns being pierced for doorways, and also on account of its allowing the application of a module, derived from the lower diameter of the columns; these had capitals, remarkable for having an unequal number, viz., nine leaves of the date-palm. The large size of many of the stones employed is also especially noticed. A curious monolith, shown in the plate above-mentioned, still exists; it belonged to the adytum of the same temple, and is perhaps the

only example of such a shrine with a top formed into a pyramidion so high in proportion to its base. This monolith is 8 feet 7½ inches deep by 7 feet broad, and about 16 feet 5 inches high from the original level to the top of the usual Egyptian cornice, which is the base of the pyramidion. It is hollowed out to form a square niche, 5 feet 2 inches deep by 3 feet 8½ inches broad, and about 9 feet 2 inches high, with a square head. Another temple with fourteen columns, 3 feet 2½ inches in diameter, described by the French, is no longer mentioned by travellers. There are also several hypogea formed in the rocks, with concave ceilings, like those at Thebes and Osioot.

ANTAKI, ANTAKIA, or ANTAKIEH. The modern name of ANTIOCH in Syria.

ANTARADUS, now called TORTOSA and TARTUS, on the mainland over against the island of Aradus. The walls, built of heavy bevelled stone, remain the most imposing specimen of Phœnician fortification in Syria.

ANTARALA. The name of the inner vestibule, *n*, generally placed between a *VIMANA*, *A*, or principal portion of all Hindu temples in the north of India, and its *MANTAPA* or porch, *C*, as explained by FERGUSSON, *Pictorial Illustrations of the Ancient Architecture of India*, fol., Lond., 1847, p. 16, with an illustration of a singular gable, p. 35. This plan is taken from the above work; *D* shews the position of the *CHAÛRI* or *MAHA MANTAPA* in front of the temple.

ANTE. A Latin preposition, entering into the composition of words in many languages, and which signifies "preceding", as in the word *ANTEROOM*. Very considerable difficulty exists in understanding descriptions of English as well as foreign buildings from the great carelessness which exists in making the distinction between this word and the Greek preposition *ANTI*.

ANTECABINET (It. and Sp. *antegabinetto*; Fr. *antecabinet*; Ger. *vorcabinet*). A large saloon, preceding the cabinet or private audience chamber of a prince or nobleman. It is also called in France the *salle d'assemblée*, as being destined not only for interviews between the owner and strangers who may not be entitled to familiar conferences in the cabinet, but for the reception of those who, being admitted to the *levée*, attend in this saloon a summons to pass in turn through a lobby into the more private chamber. It was generally handsomely decorated and richly furnished.

ANTECAPITULUM. A late Latin term which occurs in BERUTENIUS, *Chron. Marienrod.* in the following passage:—"procedentes ab ecclesia novâ consecratâ per antecapitulum et januas auditorii per circuitum cæmeterii", etc., and is explained by DUCANGE, *Gloss.*, as being that part of the cloister immediately before the door of the chapter house.

ANTECHAMBER (It. and Sp. *antecámara*; Fr. *antechambre*; Ger. *vorzimmer*). A room through which access is attained to another chamber. In England this term is generally restricted to the apartment which precedes a bedroom, while on the Continent it is frequently applied to what would here be called an *ANTEROOM*.

ANTECHAPEL (Sp. *antecapilla*). That portion of an edifice which serves as a passage to the body of a chapel or its choir. It usually ran north and south across the west end of the chapel, and may be compared to the transepts of any church which would be cruciform if the nave existed: such is the antechapel at Christchurch and at Merton Colleges, Oxford. Sometimes, indeed, it is called a nave.

ANTECHOIR (Lat. *antechorus*; Sp. *antecoro*; Fr. *avant-choeur*). That part of the principal entrance to a choir which is comprised within the outer balustrade or railing of the screen and the door placed at the back or inner part of the same screen. It is also called *FORE-CHOIR*.

ANTECLOSET. The lobby to a private closet; when the word closet is used in the sense of *CABINET*, the German synonym is *vorgemach*.

ANTECLUSORIUM, see *INCLUSORIUM*.

ANTECOURT (It. and Sp. *antecorte*; Fr. *avantcour*, *antecour*; Ger. *vorhof*). A first court, which, in large buildings, is the greatest, and precedes the *cour d'honneur* or principal court, as at Versailles and at the Hôtel des Invalides in Paris. It formerly served for communication with the stables, kitchen, and other offices. Perhaps the court called the Stable-yard at Hampton Court Palace may serve as an example.

ANTEFIXUM (It. *antefisso*; Fr. *antefixe*). This word in the plural is explained by FESTUS, s. v. as those ornaments "que ex opere figlino tectis adfiguntur sub stillicidio." It is a common mistake to apply the term not only to the check or stop of the covering or joint tiles on the roof, but also to the lions' heads in the cymatium of an antique temple; it is clearly shown by WILKINS, *Proslusiones Archit.*, 4to., London, 1837, that *antefixa* meant the ornaments of the *ZOPHORUS* or frieze, which in early times were formed in terra cotta; and that the same word was sometimes employed for the statues upon the *ACROTIERIA* of the pediments, and even the sculpture in relief on the tympana. The name is evidently derived from the circumstance that the ornaments were fixed in front of the building which they decorated, and in many instances they have been found attached to a frieze, leaden nails being employed for the purpose of fastening them.

ANTEHALL (Fr. *antesalle*; Ger. *vorsaal*). A hall which precedes the great hall of a mansion, as an antechamber precedes a chamber. Thus the Sala de la Barca is called by GIRAULT DE PRANGEY, *Arch. des Arabes*, p. 137, 8vo., Paris, 1841, the antehall to the hall of ambassadors at the Alhambra.

ANTEIAMI or ANTEMI (BENEDETTO DEGLI), completed the Baptistery at Parma as far as the vaulting, between 1196 and 1216. It was finished in 1302 without any departure from the original design. The building is fully described in MURRAY, *Handbook for Northern Italy*.

ANTEPAGMENTUM. This term, as used by VITRUVIUS, iv, 6, is equivalent to that face of the jamb, *pagmentum*, of a door or window, which is now called an *ARCHITRAVE*. The word is also used in the same chapter with the addition "superius" for the corresponding face of the lintel, *supercilium*. But in iv, 7, the term is made to imply the mouldings of that plate over the mutules, which is formed into the corona of the cornice in the Tuscan order, and on which the structure of the tympanum of the pediment is raised. RICH, *Illustrated Companion*, 8vo., Lond., 1849, well remarks that the formation of the word might signify that part of the jamb which projected before the upright pillar and the hanging style, *scapus cardinalis*, that formed the pivot on which the door turned; and as being a rebate the door could only open one way, and when shut would stop against the rebate of the lintel, while the rebate of the jamb would check the current of air at the joint or edge of the door.

ANTEPENDIUM. A late Latin term for an embroidered hanging for the decoration of the front of an altar. It is also called *FRONTAL*. PUGIN, *Glossary*, etc., 4to., Lond., 1844.

ANTEPORTICO. A name given by the French architects to a porch in front of the solid wall of a cloister, as at S. Clemente in Rome.

ANTEQUERA DE GUAXACA. A city of Mexico, made an episcopal see in 1537 or 1547. The cathedral, dedicated to S. Martial, is said to be very magnificent.

ANTERIDES (Gr. *ἀντηρίδες*, in the plural *ἀντηρίδες*; It. *speroni*). A term used by VITRUVIUS, i, 10, vi, 11, and x, 17, for counterforts or buttresses, and synonymous, according to him, with *ERISMATA*; but SALMASIUS, in *Solinum*, 1216, explains it as columns or piers; and in a similar manner HESYCHIUS understands it to mean wooden or stone posts or piers to shore up a building.

ANTEROOM (It. and Sp. *antesala*; Fr. *antechambre*, *antesalle*; Ger. *versammlungsaal*). The first room after the vestibule, in a suite of apartments, and destined for buffets and the occupation of the domestics. In France, it was usually very simply decorated; being sometimes so open to the vestibule or landing of the stairs, as almost to form a part of them. It was generally heated in old mansions by means of a stove, which marked the inferiority of this room to the second anteroom. This second room often served as an antecabinet, as a dining room, and as an audience chamber, or in the larger houses as a *salle d'assemblée* or WAITING ROOM for those who waited in this chamber for permission to enter the third anteroom; its importance was marked by the existence of a chimney. The third anteroom in great houses was reserved for those who could claim the right of being admitted at once into the *salle de dais* or audience chamber, when private audiences were not being given; and in many instances it served as an ANTE-CABINET, being a *salle d'assemblée* communicating through a lobby with the cabinet as well as with the *salle de dais*. A reference to the plans of houses of the period 1680 to 1750 will easily illustrate the above remarks. 2, 5, 6.

ANTESOLARIUM. The late Latin term for part of a house projecting beyond the face of the building. 80.

ANTEVANNA or **AUVANNA**. The late Latin term for a boarded roof projecting over a window or opening. 80.

ANTHEMION (Gr. ἀνθεμιον). "A certain spiral line in columns", according to HESYCHIUS, s. v., which explanation is accepted as meaning the Ionic volute by WILKINS, *Prolusiones Architectonicæ*, 4to., Lond., 1837, in opposition to БОЖЕН and KINNARD, the latter of whom, in his essay on the subject in the *Unedited Antiquities of Athens*, fol., London, 1830, adopting with evident uncertainty a possible interpretation of XENOPHON, *Anabasis*, v, 4, 32, considers it as meaning the HONEYSUCKLE, PALMETTE, or FLEURON ornament in the necking of the Ionic column.

ANTHEMIUS, a son of the physician Stephanus, was born at Tralles in Lydia, and brought from thence about the year 532, by the emperor Justinian, to build the celebrated church of Sta. Sophia, now the great mosque at Constantinople, which is of brick work in a peculiar cement, with iron ties, except where the masonry of the central piers was run with lead; no wood was used from fear of fire. PROCOPIUS, *De Edificiis* i, 1, states that Anthemius and his colleague, Isidorus of Miletus, were obliged, although considered to be the first mathematicians of that or any previous time, to recur to the emperor himself for advice on two occasions when the workmen believed that the edifice was about to fall; and (ii, 3) that when consulted by him on the plans for preventing inundations of the city of Dara, they were unable to suggest anything so good as his own opinion, which was found to coincide with that of Chryses Alexandrinus. Anthemius died before 557, in which year the dome gave way towards the east, and after having stood a few months it fell, carrying the semidome on that side. The work by Anthemius, *περί παύζων μηχανημάτων*, will be found in the forty-second volume of the *Histoire de l'Académie des Inscriptions*, 4to., Paris, 1786. He is said, on authority not traceable, to have died in 534. ALEX. TRALL iv, 1; AGATHIAS, *Hist.*; COMBEFIS, *Man. Rer. Constantinop.*, 4to., Paris, 1664. 59, 62.

ANTI. A Greek preposition entering into the composition of words in many languages, and which signifies "opposite to". It is used in architectural phraseology for one of two corresponding apartments placed on different sides of a centre, whether that centre be a wall or a passage. The distinction between this word and ANTE should be carefully borne in mind.

ANTICORROSION. A description of paint used for all kinds of outside stone, brick, wood, or metal work, and for stuccoed or plastered buildings. It is formed by ground glass bottles, scoræ from lead works, burnt oyster shells, and the required matter for lead, stone, or copper colour, in powder. Paint of this kind is prepared in London, and sold in a state of powder under the name

of anticorrosion, LITHIC PAINT, etc., to be mixed with cold linseed oil to a consistency of thick cream. The manufacturer asserts its readiness of use, its inflexible adhesion wherever it is applied, its resistance to damp, water, or marine acids, and its insusceptibility to fire. Paper or other substances properly covered with this material seem to be effectually preserved from the injury of insects and weather, and will besides roll up without causing the paint to peel off. As it requires to be mixed a day or more before it is used; as it is much more laborious to put on than common paint; as it wears out the brushes in a very short time; and above all as it lasts so long, when applied to iron or well-seasoned timber or masonry, as seldom to require renewal during a man's lifetime, painters very seldom recommend it. The appearance of a surface painted with anticorrosion is rough, resembling that of unrubbed cast iron or freestone; and when timber which has been once painted with it has to be cut up by a carpenter, it takes the edge off his tools (even his axe and saw), so that he also is against it. It is used, however, in some government and other large works (particularly for cast iron bridges), not suffering from the sun like paint, which by chipping, rubbing, or peeling off, leaves the metal to rust or corrode. About the year 1820 it was considered useful in hot climates for roofs, fences, and buildings, especially for shingles and weather boards; and as it answers equally well on rough as on smooth boards, it saves the expense of planing. AIDE-MEMOIRE, s. v. 8.

ANTICORROSIVE PAINT (IMPENETRABLE), see VANHERMAN.

ANTICUM, or **ANTICA**. This word, which is explained by FESTUS as meaning a gate, is appropriately used as the term for a front door, in opposition to POSTICUM; and as the Latin equivalent of the Greek words PRONAOS and PRODOMOS, or the space between the front of the cella and the columns of the portico. The word is sometimes used improperly for ANTA.

ANTIDESMA (*boro-helock*), a wood of Gualpara, East Indies, used for common furniture. 71.

ANTI-DRY-ROT PROCESS, see DRY ROT.

ANTIGONE, in Anadolia, a province of Asia Minor, was an ancient name of ALEXANDRIA TROAS.

ANTIGONI (ANTONIO), was one of the eleven architects who assembled at Gerona, January 23, 1416, to advise on the completion of the building, and he is described in the report as *maestro-mayor* of the fabric of the church of Castellon de Empurias. 66.

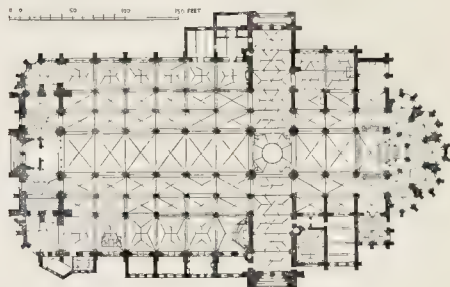
ANTIMACHIDES, is mentioned by VITRUVIUS, vii (preface), as one of the four architects employed by Peisistratus (B.C. 560-527) in the erection of the temple to Jupiter Olympius at Athens.

ANTIMENSIUM (but in Gr. ἀντιμίσσιον). The term used in the Greek church for the *altare portatile* of the Latins: ALTAR. Among the Latins these altars were made of stone, but the Greeks were not obliged to form them of such solid material, or even of wood, and generally employ for the purpose linen cloths, which are laid upon the altars of unconsecrated churches. SEROUX D'AGINCOURT, *Hist. de l'Art*, fol., Paris, 1823 (Sculpture, pl. 21, No. 13).

ANTIMETER. An optical instrument for measuring angles. 23.

ANTIMONY. A semi-metal, now much used in the arts, both for castings and in the form of an oxide for a paint. It is found in Germany, France, and England, in its native state, in which it is brittle, being united with sulphur, and having a lamellated structure composed of long needle-shaped crystals. When reduced from the ore, it is used for type metal with three times as much lead; and for stereotype metal with six times as much lead; plates for engraving music are made of it in conjunction with lead and tin; and Britannia metal consists of lead, tin, and antimony, with occasionally a little copper and bismuth. The oxide forms, besides a white paint mentioned CIVIL ENGINEER *Journal*, xi, 128, a yellow paint, of a deeper colour than

churches in Europe, which has treble aisles on each side, if the outside rows of chapels may be considered as aisles. The build-



ing was materially damaged by fire in 1533, but in the next year steps were taken for its repair; only the choir and the towers remained uninjured, owing to their leaden cisterns, which have constantly been kept filled with water. The high altar was designed by the architect Blom in 1824. The interior portal, consisting of eight coloured marble columns under the organ, was a later work by Koorblaem. The superb northern tower has been variously stated at from 366 to 466 feet in height, but is fixed at nearly 403 feet, inclusive of 15 feet for the cross, by SERRURE, who states that it ought to have had another story, but that the slowness of its construction gave occasion for the substitution of the present termination in the *style flamboyant*: the foundations were dug in 1420, and the tower was commenced in 1422, 1423, or 1429, from the designs of APPELMANS, but was not completed until the years 1506 or 1518. It has been published in a work of eight plates, with very interesting text by the architect Serrure, folio, Antw., 1840. The general restorations of the cathedral, which was completely stripped of its decorations in 1566, were begun in 1825, and are still (in 1853) in progress on the central portions of this tower. Its companion was commenced in 1433 or 1436, but only the lower half is erected. The choir received new stalls designed by the resident architect, M. Francis Durler, in 1846: *ECCLÉSIOLOGIST Journal*, 8vo., London, p. 199, of that year; PUGN, *Floriated Ornament*. The pulpit, organ front, and confessional stalls are of wood elaborately carved. In front of the cathedral is a well, with the celebrated iron framework wrought by Quintin Matsys.

The church of S. Jacques, in the *style ogival tertiaire*, is said to have been built in 1327; but SCHAYES, quoting DIERICKSENS as also MERTENS, states 1429 as the date of its commencement; it was not finished until 1560, and was renovated in 1602. The three aisles form the largest church in Antwerp, except the cathedral, it being about 328 feet long by 164 wide, and being flanked by chapels on each side of the aisles to the choir and nave. There is no regular triforium, but its place is partially occupied by panels of tracery below the windows of the clerestory. The tower is at the west end of the church, and was begun in 1491 from the designs of Thierry de Coffermaker, with the intention, not yet accomplished, of exceeding in height those of the cathedral; at its base stands the great portal, which belongs partly to the *style ogival tertiaire* and partly to the *renaissance*. The high altar, the tomb of Rubens, the numerous tombs, sepulchral monuments, and other sculptures and carvings, and an infinity of chapels, with their altars, are shown to visitors.

The church of S. Paul, formerly belonging to a monastery of Dominicans, and considered equally fine with their church at Louvain, is in the *style ogival tertiaire*; it is said to have been begun in 1540 or 1547, completed in 1571, struck by lightning in 1679, and soon afterwards restored as it now stands. It is about 267 feet 4 inches long within the walls, and consists of a nave with mean clerestory windows and a pseudo-triforium

as above mentioned; there are no transepts, only two aisles, with no windows in the northern one; a fine choir; some very excellent carved woodwork to the pulpit and organ, which is one of the handsomest in Belgium; and externally one of those remarkable additions called a *CALVARY*, entered by a porch dated 1734.

The church of S. André, belonging to the *style ogival tertiaire*, was founded in 1529, but a great portion was rebuilt in 1763, having been destroyed in May 1755 by the fall of the tower, which dates from 1756; that of S. Antonio di Padova, belonging to the Capucins, was built in 1575; that of S. Joseph, belonging to the Thérésiennes, was founded in 1611, and has also a *CALVARY*; that of S. Augustin, belonging to the monks called after him, was built about 1607-1617; that of S. Joseph, belonging to the Carmelites, is in the same style; and that of S. Bruno, in the Rue S. Roch, is dated 1673, with a new portal dated in 1835. But these are all inferior to the magnificent church of S. Carlo Borromeo, belonging to the Jesuits, and built by a lay brother Pierre Huyssens, under their rector François Agullan, of Brussels: the design of the whole edifice is generally attributed to Rubens, and certainly a drawing of the front by his hand existed in their library in 1763. Although it is one of the grandest churches which that order has raised in Europe, and in richness of material surpassing all others in Belgium, yet it was only six years in hand, from 1614 or 1615, having been consecrated in 1621. The interior is in two ranges of the Doric and Ionic orders, with an iron railing between the pedestals of the upper order. The tower is considered the most remarkable of any such works erected in Belgium since the epoch of the Renaissance: this, with the front, the sacristy, and the chapel of the Virgin, alone escaped destruction by fire caused by lightning in 1718: the restorations were commenced the next year, but the columns of the nave were executed in stone instead of as formerly marble; the façade is now (1853) under repair: this church is full of finely carved woodwork. The marble employed was brought from Genoa.

The church of S. Walburgh has been laicised for upwards of a century, *i. e.* about 1750. The arched passage under its tower is an interesting feature. The church of S. George, designed by M. Suys fils, still unfinished, may be styled the largest of the Gothic churches as yet constructed of late years in the country; it is of brick, with three naves or aisles of equal height.

The Hôtel-de-Ville, designed in 1560 by Cornelis de Vriendt, called Floris, was destroyed by fire in 1576, and reconstructed as it now appears in 1581, with a façade, under repair in 1853, consisting of two orders and an open loggia at top, rising above a rusticated base 230 or 250 feet long; the columns are of *marbre rouge*, and the pilasters and all the exterior dressings of *pierre bleue*; there are two very handsome chimney pieces in this building. Besides the old Bourse, in the street of the same name, built in the *style ogival tertiaire* in 1515, and the English bourse, Antwerp had occasion for a new exchange in 1531, which consists of a building surrounding a court-yard, 167 feet long by 131 feet wide in the court, supported by an arcade all round, 19 feet 6 inches wide, formed by arches on sixty-two columns of the *pierre bleue*. The tribunal and chamber of commerce occupy the apartments over the arcade: the area is, in 1853, being covered with a glazed roof, with a large oval central lantern of cast iron, as illustrated in the *BUILDER Journal*, fol., Lond. 1852, p. 321: the roof is designed by M. Charles Marcellis, born in this city but resident at Liege.

Remains of a door and three towers belonging to a castle built on the *Werf* by the Normans in 885, are now concealed by houses, etc., erected in 1840. Nothing but a gateway and an entrance façade (built in the *style ogival tertiaire* in 1520), remains of the vast prison called *Het Sleen* (the "stone jug" of English slang language). Among minor objects of study, the architect will do well to visit another gate, constructed in honour of Philip IV of Spain, 1624, called

the *Porte de l'Escout*; the maison Hanséatique, 230 feet long by 200 feet deep, built in the style de la renaissance in 1564-1568, and now let out as workshops; the *Boucherie*, 144 feet long by 54 feet wide, built in the style ogival tertiare in 1501-3, which is remarkable for its alternate bands of brick and white stone; the *Entrepôts*, or bonded warehouses, and new Custom-house, built by Roelands in 1829; the maison du Géant, formerly belonging to the Teutonic order, in the Rue des Nattes; a chapel, belonging to the style ogival tertiare, in a private house in the same street; the Chambre du Conseil of the Brewers' Guild; the house of Rubens, in the street called after that artist; an infinity of handsome porches, doorways, and cornices; a curious vaulted ceiling, almost Moresque, to the lateral entrance of the church of S. Augustin.

Besides a small theatre "*des Variétés*", there is a larger theatre for operas, etc. (designed by Bourla), commenced 24th August, 1829, and finished in 1834; it is very handsomely decorated, with an exterior terminating in a plan which is a portion of a circle composed of columns standing on an arcaded basement, having a very happy effect.

The other chief public buildings are the *palais de Justice*; the royal palace, in the middle of one side of the noble street called the *Place de Meir*, from having once been a canal; the museum, containing the Royal Academy of Fine Arts, with the public picture and sculpture galleries. Antwerp also possesses a zoological and a botanical garden; a public library in the hôtel-de-ville; a royal athenæum; a medical school; the buildings of seventeen convents, of which six are occupied, and of fourteen monasteries; an *atelier de charité*, or workhouse; five asylums; twenty-six almshouses called *maisons de Dieu*; two civil and one military hospitals; four barracks; a building in the Rue Everdy, called *la cité*, serving for concerts, auctions, and some of the commercial tribunals, its area is a temporary bourse, having been covered with a glazed roof; and two railway stations of no great importance, that presenting most architectural features is situated near the great military arsenal, on the quay which is lined by a row of elm trees. There is also an association called the *Cercle Artistique*, for the promotion of science, literature, the fine arts, and music, consisting of about 2,000 members, for whom the king, at his visit to Antwerp in 1853, laid the first stone of their new building, to consist of a theatre, with lecture and committee rooms, libraries and other conveniences; the façade is in the style *Rubens*, 105 feet long and 60 feet high; the plans and elevations are by M. Joseph Schadde.

In the suburbs of Antwerp, are several villas, by Schadde, in the style *Espagnol* and *à la mode Anglaise*, and two new churches, of which the one built by Berckmans was the first of any importance constructed in a pointed style during the present century in Belgium. The first stone was laid 3rd June, 1841, and the whole was completed in 1846. The central-aisle is 54 feet and the two side aisles 26 feet high; the church is 177 feet long from east to west, by 65 feet 6 inches wide, and 98 feet 6 inches long from north to south, by 32 feet 9 inches wide. The simplicity and beauty of proportion in the interior are rivalled by the rich effect of the exterior design, which is executed in brick with stone courses and dressings. The entire height of the tower is 177 feet, the spire being of burnished copper varnished with caoutchouc.

VANDER MAELEN, *Dict. Géogr. de la Province*, 8vo., 1834. BECANI, *Origines Antverpienses*, fol., 1580. HAGHE, *Pict. Sketches in Belgium*, etc., fol., Lond., 1840. LEROY, *Not. Marchionatus S. R. I.*, fol., Antw., 1678. PAPEBROCHIIUS, *Annales Anto.*, 8vo., Antw., 1845-48. Plans, etc., of the cathedral are given in *Chiese principali d'Europa*, fol., Milan, 1824. A plan of the city is published in the maps of the Society for the Diffusion of Useful Knowledge, No. 163. NASH, *Architecture of the Middle Ages*, fol., London, 1838.

ANTWERP BLUE. A water and oil pigment of the same nature, preparation, and uses as PRUSSIAN BLUE, but lighter

and brighter in colour, in consequence of the presence of a larger proportion of the earthy base in the ferro-cyanate of alumina of which it is composed. HAERLEM BLUE. 9.

ANTWERP BROWN. An oil pigment formed by the addition of drying oil, by means of heat, to a solution of bitumen in turpentine, called ASPHALTUM, which latter then becomes less liable to crack and less transparent, and dries with difficulty. The same name is given to heated bitumen ground in linseed or drying oil, with similar results. 9.

ANTWERPEN (WILHELM VAN) is mentioned by VASARI as a good sculptor and architect who flourished about the year 1550.

ANURHADAPURA, corrupted into ANARAJAPOORA. A city founded B.C. 540, which became, B.C. 437, the capital of the kingdom of Candy in the island of Ceylon. The walls, built to face the cardinal points of the Compass, are said to have been erected A.D. 60, and to be now indicated by ruins enclosing a square of sixteen miles on each side, which contained numerous gardens, water-courses, etc., as well as the public and private buildings of the city. Seven DAGOBARS are described as solid domes, the altitude of which (including the drum) is equal to their diameters; they are surmounted by a sort of pinnacle, and stand on a square flagged platform; that called the Ruanwelle dagobah is 270 feet high, on a platform 500 feet square, paved with granite; surrounded by a fosse 70 feet broad. The foundations are said to be 222 feet deep, and some credit appears to be due to this statement. The solid contents of another dagobah are estimated at 416,000 cubic yards. The Thuphara maya dagobah, erected, it is said, B.C. 307, is about 50 feet high; it is surrounded with four rows of long slender columns, originally one hundred and eight in number; each column is about 24 feet high, in two blocks of granite, one of them forming a square base and octagonal shaft, the other containing a capital, about two feet high, consisting of small figures grouped round the lower part of the projecting ornament (FORBES, i, 241): although not the largest, this is considered the most elegant monument in the city, and one of the finest specimens of Cingalese art. There are also the remains of a square *porticus*, which consisted of sixteen hundred stone pillars, each about 12 feet high, 24 inches wide, and 18 inches thick, in forty ranges of forty columns each, the central piers being twice as thick as the external ones, which have been split to afford fresh materials for repairs. From the small space of two or three feet between the pillars, and from a tradition of the building having been as high as wide, viz. 231 feet, with nine stories in height, each containing a hundred apartments, it is clear that there was some such superstructure (called the brazen palace from being roofed with metal), which must have been one of the largest buildings ever constructed in the East. It dates from the year 150 B.C., the era of the ruler Dutugamoni, whose granite trough for holding the food of his elephants is still shown; it is a single block, with an excavation nine feet long, 4 feet broad, and 2 feet 6 inches deep. The city was deserted A.D. 769, and is now only known because of its having been made the seat of a district court and of a government agency. For a full account of these remarkable ruins and of remains of minor importance, reference may be made to the following authors: FORBES, *Eleven Years in Ceylon*, 8vo., Lond., 1840; KNIGHTON, *The Ruins of Anuradhapura*, in Journal of the ASIATIC SOCIETY, 8vo., Bengal, March 1847, p. 213; CHAPMAN, *Remarks on the Ancient City of Anuradhapura*, etc., in Transactions of ROYAL ASIATIC SOCIETY OF GREAT BRITAIN, 4to., 1835, vol. iii, Part III, p. 463; DR. BUTTS, *Rambles in Ceylon*, 12mo., Lond., 1841.

ANVANNA, apparently an old mistake for AUVANNA.

ANVIL (It. *ancudine*, *incudine*; Sp. *ayunque*; Fr. *enclume*; Ger. *amboss*, *anvos*). An iron block of various forms, used by smiths as the hard surface upon which they hammer the iron in forging and other operations. The usual method of making large anvils was to forge a nearly cubical mass of iron for the body, A,



and then to unite to it a strong projecting, pointed, and rounded piece of steel called a pike, bickern, or beak-iron, *B*; a quarter, *C*, which has a hole to take various tools; and feet, *D*; with a smooth steel face laid on the top of the body and quarter. As the portions separately detached could only be secured by welding, which was ineffectual beyond an inch or two from the edge, Mr. King suggested the process of manufacturing the upper half from one piece of iron, and the lower from another, in order to save the anvil from the destruction which was consequent upon the former method. SOCIETY OF ARTS, etc., *Transactions*, 8vo., Lond., 1820, vol. xxxviii. The surface is generally horizontal, but it has been found that a *V* shaped anvil prevents the disposition of a bar of iron to spread its particles from its centre under the hammer, and tends to a closer connexion of those particles, as explained by the inventor, Mr. James Nasmyth, in a paper read to the British Association, etc., at Edinburgh in 1850, and reported in the CIVIL ENGINEER, etc., *Journal*, for that year, p. 292. STAKE.

AOSTA (the Roman AUGUSTA PRÆTORIA). The capital of one of the Piedmontese divisions of the same name, in the kingdom of Sardinia. The river Dora-Baltea flows through the town, and on each side of the stream are rows of trees with houses forming the principal street. The cathedral, dedicated to the Assumption and S. Gratus, dates from the fifteenth century, and is in good preservation. There are also three parish churches and a convent, which, after many changes, is now used as a *collège*. The antiquities consist of portions of a viaduct, which formerly was a bridge; a triumphal gate; a round tower or mausoleum, built of a species of pudding stone, hard and capable of great finish, obtained in the district; many portions of sculptured stone; a gate having two ornamented façades, with a space of about 40 feet between them, and two small arches and one central larger opening in each of them; considerable remains of the ancient walls with square towers at intervals; and some of the pillars and arches of an amphitheatre, with vaults called the dens, for keeping wild beasts, but certainly used as cellars for a neighbouring monastery; passages from them exist communicating with the arena, which is planted with trees. BLAU, *Theatrum Italiae*, etc., fol. Amst., 1772. W. H.

APAGINÆ, APAGINES, or APAGINETULI, see HARPAGINETULI.

APAMEIA, APAMEA, or APAMIA (formerly *Fameiah*, but now *Kulat el Mudik*), a city of ancient Syria, situated in the valley of the river Orontes, and remarkable for the ruins of edifices of a highly ornamental character and of an enormous extent. 23.

APAMEIA, the ancient name of ΑΠΙΟΥΜ-KARA-HISSAR, in Anatolia.

APAREJADOR or APARIGERDOR. A Spanish word used by English writers on Art; it is the official name for a surveyor, in the senses of attached architect or clerk of the works (ALCANTARA, AGUIRRE, etc.); and corresponds with the late Latin term *apparator* and *adparator* in the English Close Rolls of the fourteenth and fifteenth centuries, wherein the word *apparil* seems to be connected with the present French term *appareilleur*. 66.

APARINÆ, see HARPAGINETULI.

APARTMENT (It. *appartamento*; Sp. *aposesto*; Fr. *appartement*, *chambre*, or *pièce*; Gr. *zimmer*). A space enclosed by walls, a floor, and a ceiling, and occupied as a dwelling. This word in the singular number has a meaning in England very different from that given to it on the continent. Here it implies simply one room, generally a bed chamber; while abroad *appartement de plein pied* means a set of chambers on the same level. This is almost the use of the plural number in the English language, which speaks of them as private, or as apartments of reception, of state, or *en suite*. Every apartment should have a marked character; so that the visitor on entering should be in no doubt as to the purpose of the room. Private

apartments claim the greatest consideration as to ASPECT and ACCOMMODATION; and special attention to their easy communication with the larger apartments, with each other, and with the waiting-rooms of the servants. The greatest mistake of the present time is to place them too near the offices, and even looking into the stable yards.

In reading descriptions of old mansions, and indeed of several of the modern palaces on the continent, it must be remembered that the *appartement privé*, as used to express a suite of apartments—CHAMBERS, LODGINGS, ROOMS, RESIDENCE—is frequently divided into three portions, each having its separate approach, vestibules and staircases: the centre forming the reception or morning room, eating-room, library, and with-drawing room, common to the lady's and lord's sides, as they are called in old plans, which are arranged with chambers adjoining to each other and the inner rooms: each side contains an entrance hall, vestibule, parlour, chamber and ante-chamber, dressing-room and servant's bedroom, with all the necessary appendages; and in cases of considerable expenditure, the gentleman's side is provided with a billiard room and cabinets for study or business, while on the lady's that space is now devoted to the boudoir and nursery.

Apartments of reception or *de société*, are only modified saloons of state or *parade*; the Palazzo Vecchio at Florence (especially the rooms above the Salone), and the Palazzo Doria Panfilì at Genoa, offer excellent instances. It is sufficient to observe that where both suites exist, the lesser should be so disposed as on great occasions to form convenient and fitting portions of the whole building, then thrown open.

Apartments of state, or *de parade*, are presumed to be of ample dimensions, with vestibules, ante-rooms, saloons, galleries, state chambers, cabinets, and all other appurtenances of luxury, according to the idea of the time; although in England, at the present period, they are almost restricted to a single room and its approaches.

As to apartments *en suite*, a considerable change took place at two different periods in the planning of apartments. In the first, architects sacrificed the convenience of easy communications to the dignity of a long façade, produced by magnificent saloons and suites of rooms which allowed a file of visitors to pass through them, next the windows, so as not to be disturbed by the domestics passing to the back corridors of communication and service: such is the case at Hampton Court: but the style, perhaps introduced in Italy, grew to its height in France and Germany. In the second period, the architects of the latter half of the eighteenth century, especially in England, placed the line of *enfilade* in the centre of the apartments, so as to produce an important vista through large apertures, in order to accommodate a fashion that is beginning to resume the empire which it afterwards yielded, in the beginning of the nineteenth century, to the invasions of the COTTAGE ORNÉE.

APENDARIA, APENDIMENTUM, and APENTICIUM, see APFENDARIA.

APERLÆ (improperly written ΑΠΕΡÆ and ΑΠΥΡÆ). A city situated in the valley of the Cassaba, in the ancient province of Lycia in Asia Minor. TEXTIER, *Desc. de l'Asie Mineure*, fol., Paris, 1839, iii, pl. 206-209, observes that it is the only place wherein an ancient Lycian house can be seen. The example given is the front wall, built in irregular courses of masonry, with a door between two windows having large lintels. A bath also decides in the most peremptory manner, as he thinks, many questions as to the mode of construction called Pelasgic. The bath is built without mortar, is in perfect preservation, standing isolated near the sea, and does not appear to have been used by the moderns; its construction is homogenous, and there are no signs of addition or restoration. An inscription expressly states that it was built *ἐν θεμελίῳ*, from the foundations, in honour of the emperor Titus; whence TEXTIER concludes that even in the first age of the Christian era, buildings were erected with irregular joints simultaneously with regular courses underneath

them, with hemicycles or apses, and arches with voussoirs, as if the architect had taken care to insert specimens of each mode of building known to him, and to write expressly the most important part of the necessary information. A small Doric temple is rather more ancient. The Acropolis contained a specimen, on a small scale, of every public building necessary to classic civil life: there are a temple, theatre, cisterns, and an odeum, which was 69 feet in its greatest diameter, the orchestra being 19 feet wide.

APERTURE, written **APERIONS** in some old works (It. *apertura*; Sp. *abertura*; Fr. *ouverture*; Ger. *öffnung*). An opening made for entrance, light or ornament, in a wall, as for a doorway, chimney, window, etc. The proportion of these apertures has always been a matter of the most serious study, and several rules have been proposed, all of which fail in proving their title to be considered as formulæ for constant adoption: that of aliquot parts is the one which has been most generally followed. The sides of an opening are termed jambs, and the top the head or lintel, which is either a beam, or an arch, either curved or flat; if the latter, it should rest upon a bar of metal. The bottom of a door or window is called the sill. In Greek and Egyptian architecture the jambs sometimes incline towards each other. It is advisable that they should never be placed too near the angles of a wall, a rule which, however, is by no means universally observed.

APEX (It. and Sp. *apice*; Fr. *sommet*; Ger. *spitze*). The Latin term adopted in the English language for the top of a roof, spire, cone, or pyramid.

APHITES, sometimes called Memphis marble, a pure compact limestone, found in Egypt, along the valley on the east side of the Nile. It varies in colour, from a deep red to black, retains its polish, and is hard; in some of the quarries where it is found mixed with sandstone, it resembles in colour the Egyptian of the ancients.

W. H.

APHRODISIAS (formerly called **LELEGEPOLES**, **NINOE**, **TAUROPOLES**, and by the Christians **STAUROPOLIS**, now **GHERA**, or **GHEYRA**). A city in the ancient province of Caria, in Asia Minor. The ruins extant are described by **TEXIER**, *Descr. de l'Asie mineure*, fol., Paris, 1839, as consisting of a temple to Venus Stratonice, which has been converted into a basilica. The columns are of the Ionic order, 34 feet $1\frac{1}{2}$ ins. high, 3 feet 8 ins. in diameter, and were apparently ranged in the octastyle pseudodipteral manner, with an additional range internally to the posticum, as at **AIZANI** and **MAGNESIA**, making altogether fifteen columns on the sides: the mouldings of the bases are remarkably interesting. It appears that one extra column in front and two at the rear were added to each side colonnade of the temple. When it was made a basilica by destroying the cella and using its materials for an enclosing wall outside, the whole extent of the ancient temple, a nave and two aisles, separated by these superb columns, was formed at little cost beyond the expense of the additional apse. It is doubtful whether a double range of columns of a Roman-Corinthian order, twenty-four in number, and about sixteen inches in diameter, which stood a little in advance of the front of the basilica, belonged to a *porticus* in Pagan times, or to the narthex of the Christian basilica; it has been suggested that they were only pedestals for statues. In front of these are two noble basins of white marble, 15 feet 9 inches in diameter, and between these and the enclosing wall are two couchant lions. The wall of the peribolus was enriched with a beautiful Roman-Corinthian order having a pulvinated frieze and dentilated cornice; the horns of the capitals were not truncated: the columns projected one diameter, or 2 feet 6 inches clear, from engaged pilasters, and were placed in pairs about 9 feet distant from centre to centre under pediments, which were alternately triangular and segmental: between these pairs there was a space of 25 feet 7 inches from centre to centre of the columns, containing a square niche similarly adorned with a smaller order. The city also contains a portico, with

four spirally-channelled columns of a Corinthian order; an agora, 328 feet square, with forty columns; and a very perfect stadium or hippodrome, with twenty-six rows of seats, which was 270 feet wide and 757 feet long within the top range of arcades. **LABORDE**, *Voyage en Orient*, etc., fol., Paris, 1838.

APHRODISIUS. A man of consular dignity in the time of Theodoric, is mentioned as an architect by **MILIZIA** on the authority of **SYMMACHUS**, *Ep.* x, 39.

APIARIUM. The Latin term for the place where bees were kept, as appears from **COLUMELLA**, ix, 5, 6. The difference between this word and **ALVEARIUM**, which is the correct term for a stand or house for bee-hives, will be quite evident when it is considered that the Roman apiarium was a garden appropriated to plants which supply the wants of bees. The use of the word in the English form **APIARY** has been restricted to that above given to alveary, namely a place or house in which hives are kept. The early Romans placed the hives in niches formed in the walls of the farmhouse, under the shelter of the eaves (*subter subgrundas*), but they afterwards formed a regular apiary (*alvearium, mellarium*), which was carefully kept from the influences of any exhalations from kitchens, stables, etc.: and they arranged the hives in not more than three rows, one above the other; especial care being taken that there should be a plinth at least three feet high from the ground, coated with smooth stucco, to prevent as much as possible the approach of snails, lizards, etc.; a supply of pure water; and large plantations of cytusus and thyme.

An aspect of five points to the eastward of south is perhaps the best for the entrance to the hive, and the shrubs or plants in front should be kept so far away, or so low, as to allow the bees to fly out horizontally, or at an angle of not more than 30° or 40° elevation. The simplest means of securing the hive seems to have been to set it upon a post, to which it was secured by a lock. This mode of preventing the approach of small reptiles was very early in use; the next manner of arranging the hives seems to have been, that of placing them in one or more rows upon a shelf; and this has not been improved, except by the addition of shutters, to exclude the heat in summer and the frost in winter. In spite of the well understood correctness of the precautions hereafter enumerated against animals of any sort, and the equal certainty that walls and hedges shelter snails and insects, many ranges of hives are placed on shelves against a wall or in a recess, frequently covered with ivy or other climbing plants. The most complete arrangement is that in which the hives are ranged under the centre of a roof, on a stand placed in a tank of water, and are thus secured against the attacks of any wingless enemies, except of a water-rat or a spider: the roof is supported by posts, standing in pools of water connected with the central tank: and carrying shutters, casements, or sashes, which reach to within seven or eight inches of the ground, in order to exclude the extremes of heat or cold: small holes, about half an inch high and two or three inches wide, are made in the shutters, opposite to each hive, and a ledge is provided for the bees to alight on as their threshold, as well as another to throw off any heavy drip of rain-water. Serious objections are raised by many persons against putting the bees into such a room, inasmuch as carelessness or want of judicious attention may over stimulate the insects by keeping them too warm, or may retard their labors by preventing the natural influence of daylight.

APODYTERIUM (Gr. ἀποδυτήριον). The name said to have been given, in accordance with its derivation, to the undressing room in the ancient thermæ and palæstræ in which the visitors took off their clothes and left them in the care of attendants, called *capsarii*, from the lockers, and *capnarii*, from the horns which received the garments. **LUCIAN** uses the word *apothesis*; from which circumstance, and from the absence of any apartment apparently used in the small ancient baths which have been discovered, it is supposed that the **FRIGIDARIUM** was frequently fitted with closets, and these also served as the

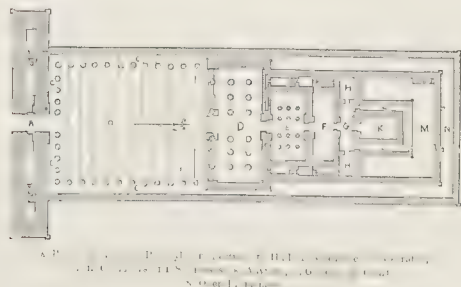
apodyterium or spoliatorium, as it is sometimes called. In the illustration, Pl. 1, fig. 2, of the article BATHS AND WASH-HOUSES, the room which is called apodyterium is seen furnished with a seat on three sides; and with six doors, two for entrance from the exterior; one to the hot and cold baths respectively; another to a small closet, which probably held the valuables of the bathers, and perhaps served as the store of unguents of the frigidarium; and another led to the stoker. The same room also contained a window, with a lamp in a niche under it, and a number of holes in the wall for the insertion of the wooden clothes pins. The difficulty of assigning names to the rooms traced in the ruins of the great thermæ of Rome, renders it impossible to point out which were the apodyteria. VITRUVIUS does not mention this term, indeed the younger PLINY is the only Roman writer who has used it.

The room before the Convocation House at Oxford is called by this name at the present time. W. H.

APOGEUM or APOGEUM. A late Latin word, used instead of HYPOGEUM, for a crypt. 80.

APOGRAPH. The name of an instrument invented in 1823 by Mr. Andrew Smith, of Mauchline, in Scotland, for the purpose of enabling person unacquainted with drawing to copy pictures, drawings, and maps, "with a fidelity unknown to any manual production." ACKERMANN'S *Repository of Arts*, etc., 8vo., Lond., 1823, p. 122.

APOLLINOPOLIS MAGNA (EDFOO; in Coptic *Atbô* or *Phbôn*). A city on the left bank of the Nile, a little south of Thebes, in Egypt. It has two temples; the larger of which may be compared, for the conception of the plan, the grandeur of the design, and the execution and richness of the ornaments, with the most magnificent erections in any country; and the attention of travellers even the most familiar with the other productions of Egyptian art, is immediately arrested by the remarkable harmony and regularity of the plan; for this edifice, one of the largest in the Thebaid, is still the most complete and the best preserved of all similar structures. The total length of the temple, which was dedicated to Noum, is about 450 feet, the whole width of the façade of the pyla is 226 feet 4 inches.



It appears to have been founded by Philometor, and completed by Physcon or Euergetes II, whose names are engraved on the face of the temple and the portico; the cartouches of Lathyrus occur on the abacus of the columns, and on the exterior of the area and portico: Alexander I is named on the enclosure walls, and the pylon exhibits the titles of Ptolemy the elder, son of Auletes. The small figures at the west corner of the pylon, are accompanied by the name of Tiberius Claudius Cæsar. Each pylon is about 104 feet long, 37 feet wide at the base, and 115 feet high; it affords a good example of the staircases and mode of lighting adopted in such works: the top would be 84 feet by 20 feet. The arrangements here made for the reception of temporary flagstaffs are of considerable importance to the student of Egyptian monuments, as deciding the manner in which these immense masts were supported. The temple consists of a sanctuary surrounded by corridors, preceded by two halls and two porticos, all included in a general boundary wall 414 feet

long by 154 feet wide; one of the shorter sides contains the pylon and a doorway 52 feet 6 inches high. The area, 161 feet, by 140 feet, between the pylon and the first portico, is surrounded by a peristyle about 35 feet high, consisting of ten columns at the entrance, twelve on each side, and six, which are larger, in the façade of the portico, making in all thirty-eight; those of the angle in front being counted in each colonnade. As the whole of this area is covered by steps, the columns become shorter as the visitor approaches the portico, which is 56 feet high, and consists of three ranges of columns, or eighteen pillars altogether; these are more than 6 feet 6 inches in diameter, and nearly 42 feet 7 inches to the underside of the soffit.

Passing through this pronaos, a doorway opens into a species of hypostyle hall, 66 feet long by 43 feet wide, supported by twelve pillars, to this succeeds another long and narrow room, from which there are two small entrances to the side galleries, wherein are flights of steps leading to the roof. The last-named chamber gives access to another small one, with an apartment on each side of it, and, through that to the adytum, which is about 34 feet long by 17 feet wide: a passage runs on each side of it and into a back covered court, and there is an uncovered path continued from the first peristyle all round inside the wall of enclosure. Altogether six doorways are passed before entering the sanctuary, *secos*, or *cella*, which is about 32 feet 10 inches long by 16 feet 4 inches wide. The columns of the inner portico or pronaos are not less than 5 feet in diameter. At the back of the temple or posticum are two half lions, with water channels between their paws, and there were probably similar figures at the angles of the great doorway in the pylon. In short, the temple is the beau idéal of such an Egyptian edifice described by STRABO, *Geog.*, xvii. The capitals of the columns of the peristyle vary in the same row, but the corresponding capitals in the opposite range are respectively similar. The portico has never been finished.

The smaller temple is situated about 578 feet from the building just described: it appears to have been founded by Physcon and Lathyrus: it is 78 feet 9 inches long, 47 feet 6 inches wide, and 24 feet 6 inches high, and is composed of two halls, surrounded on four sides by a gallery of columns 2 feet 9 inches in diameter *in antis*, six on each side and two on each front. The building belongs to the class sometimes, but improperly, called a TYPHONIUM. The peribolus has been destroyed by the Turks.

In consulting the illustrations given in the *Description de l'Égypte*, Pl. 1, the text must constantly be consulted to correct the errors of the plates. A model of the smaller temple, made by Mr. Dighton, is now in the collection of the Royal Institute of British Architects. JOMARD, *Descr. des Antiq. d'Edfoou*, fol.

APOLLINOPOLIS PARVA. (*Koos* or *Goos* of Wilkinson, *Quous* of the French savans.) A city in Egypt, situated on the east bank of the Nile, a few miles north of Thebes. It is mentioned in the *Description de l'Égypte*, Pl. iv, text, vol. iii, as containing the cornice of a gateway inscribed with the name of Ptolemy Philometor, and for a monolithic niche, having a top of a low pyramidal shape; it bears the name of Ptolemy Philadelphus, and being overturned is now used as a tank.

APOLLO, also called Phœbus, and Helios. The bay-tree, the lyre, the hawk, raven, swan, and grasshopper, and the number seven, were peculiarly dedicated to this deity, whose worshippers erected on the coasts of Asia Minor, and in Bœotia, Attica, and the Peloponnesus, numerous temples, for every one of which he had a local epithet: thus he was called Didymæus from a town near Miletus; but in some cases the title was distinctive; as Epicurius at Bassæ; Maleates at Sparta.

APOLLODORUS of Damascus, executed for the Emperor Trajan, A.D. 104, the magnificent stone BRIDGE, the remains of which are still visible near the junction of the river Alt or Aluta with the Danube. He also erected at Rome, for the same

sovereign, an odeum, a gymnasium, the Forum Trajanum, and according to some authors the column dedicated to Trajan, A.D. 114, in that Forum; the basilica Ulpia; a bibliotheca; the thermæ Trajanæ; and several aqueducts and roads, or, more probably, repairs to such as already existed. He was exiled on the accession of Hadrian, for the severity of his previous criticisms, and put to death, on a repetition of the offence, a little before the death of the emperor, which took place A.D. 135. XIPHILINUS. PROCOPIUS, *De Edif.* iv, 6; DIO. CASS., *Hist. Rom.*, fol., Hamb., 1752, lxi, 4, and notes. A bust inscribed with this name is in the Glyptotheca at Munich; but a repetition of the same in the Capitoline Museum, 1, 81, is entered as unknown. 3.

APOLLONIA (the Arab MARSA SOUSAH). A town on the sea-coast of the district anciently called Cyrenaica, in Africa. The site is marked by the ruins of the citadel, two temples, an aqueduct, and a theatre, which from its situation is called a quay by PACHO, *Relation d'un Voyage*, etc., 4to., Paris, 1828-9, p. 162.

APOLUTIUM, a late Latin term, probably a corruption of *ablutium*, a laundry. 80.

APONSA. A late Latin word for a shed-roof, of which the rafters rest on or let into a wall. 80.

APOPHYGE (Gr. ἀποφυγή; It. *apofigi*, *imoscapo*; Sp. *escapo*; Fr. *congé*; Ger. *ablauf*). A term used by all writers on architecture for the hollow connecting the shaft of a column, with the fillet at the base, and perhaps also with that at the top, in conformity with a supposed reading of VITRUVIUS, iv, 1 and 7. APOPHYSIS. APOTHEOSIS. ESCAPE. SCAPE. SPRING.

APOPHYSIS (Gr. ἀποφύσις; It. *apofigi*, *imoscapo*; Sp. *escapo*; Fr. *congé*; Ger. *ablauf*). A term used by VITRUVIUS, according to the best editions, in places where his commentators use the word APOPHYSIS. The explanation of either word is accompanied with difficulty, inasmuch as the word occurs in Vit. iv, 7, in reference to the hypotrachelion of the Tuscan column: which passage may mean either the fillet and hollow, or the hollow alone; but when speaking of the Tuscan base, it is admitted that he means by apophysis, the fillet without the hollow. SCAPE.

APORA, ARFORA, or ÆBURA, an ancient name for TALAVERA DE LA REINA, in Spain.

APOSTA, or ARPOSTA, see DESTINA.

APOSTOLEUM. A late Latin word used to denote a church dedicated to any one or more of the apostles, SS. Andrew, Bartholomew, James the Greater, James the Less, John, Jude, (whose name is also written Lebbeus or Thaddeus), Matthew (also called Levi), Matthias, Peter, Philip, Simon, and Thomas.

APOTHECA. (Gr. ἀποθήκη; It. *bottega*; Fr. *boutique*; Ger. *laden*.) The Latin term for a store-room of any sort in which valuable goods were kept. As a store-room to contain amphoræ of wine, it only differed from the cella vinaria by communicating with the FUMARIUM, above which it was sometimes placed.

APOTHECARERIUM. (It. *spezieria*; Ger. *apothek*.) The room or suite of rooms in an hospital or other establishment, serving for the reception of medicines, etc. Those of Sta. Maria Novella at Florence; of Dresden furnished with fourteen thousand silver chests; and of Loreto with three hundred and eighty vases of Majolica ware; said to have been painted from the designs of Raffaello and other great masters, by Orazio Fontana of Urbino; were the most celebrated of such establishments.

APOTHEOSIS. (Gr. ἀπόθεσις; It. *apotesi*, *sommoscapo*; Sp. *escapo*; Fr. *congé*; Ger. *anlauf*.) A term used by VITRUVIUS, iv, 1, in the passage in which he directs that the width of the Corinthian capital should be the same as that of the top of the shaft, except the astragal and apothosis; here it would mean the hollow. Perhaps the transcribers of manuscripts have erred, and apothosis should be, as it often is, applied to the top hollow, and APOPHYSIS or APOPHYSIS to the bottom one: or, as it only occurs in the passage above-mentioned, the word apothosis may

have been written by mistake for the last of these words. SCAPE.

APOTHEOSIS is used by LUCIAN, *Hippias*, as the term for each undressing closet in the thermæ erected by Hippias. APODYTERIUM.

APOTHEOSIS. A portion of the primitive churches, usually placed on the south side of the chancel, and furnished with shelves to hold books and vestments, and which gave rise to the introduction of the modern vestry. W. H.

APPARATORIUM, or ADPARATORIUM. A word said by FABRETTI, *Insc. fol. Romæ*, 1699, 232, to mean a place attached to a sepulchre for the reception of the attendants on the mourners: the word, however, has been construed to denote the place where the funeral pile or *bustum* was prepared. 80.

APPARATUS. The term denoting the mechanism belonging to any philosophical invention, in opposition to the terms PLANT and INSTRUMENTS. HEAT. VENTILATION.

APPELMAN, or APPELMANS. (JOHN or PETER.) On the authority of BAERT, Peter Appelmans flourished at Antwerp in 1412; built the church of S. George, commenced the cathedral, and designed (*tooleyde*) its northern tower, died 25 May 1434, and was buried at S. George's; DIERICKSENS quotes PAPEBROCH to the effect that, some say Peter Appelmans, who began the building of the church of S. George, built this tower; but others name Joannes AMELIUS of Bologna; GRAMAYE names Joannes Amelius. MURRAY, (*Handbook for Belgium*, 12mo. Lond. 1850), says that Appelmans of Cologne finished the work in 1518; the inscription placed on the enclosure wall of the museum at Antwerp, states that Peter Appelmans died 25 May 1434: and a street close to the cathedral is called Appelmans strasse. The best investigation into the proper name of this architect, seems to be that of SERRURE, *Not. hist. sur la Tour de l'Eglise de Notre Dame d'Anvers*, fol. Anv. 1840; who cites a MS. collection of epitaphs made in the sixteenth century, for the following inscription copied from the original tombstone of the architect in the church of S. George (now destroyed) at Antwerp, viz:

"Hier legh begraven Jan Appelmans metser van der metselryen der kerken in de Stad van Antwerpen die den toeren tot onser liever Vrouwe toeleyde en sterff int jaer 1434, xve. in meye."

SERRURE wishes to show that *Appel-man* is equivalent to *da-mela*; but is not quite successful: if the christian name and place of birth are really different, Amelius might have been contemporary with, or successor to, Appelmans.

APPENDAGE. (It. *appendice*; Sp. *appendice*; Fr. *dépendence*; Ger. *zubehoer*.) This word, when correctly applied, denotes an addition not essentially necessary, but arbitrarily made, to an edifice; such as a portico which does not form an integral portion of a house.

APPENDARIA, APPENDENTIUM, APPENDIA, APPENDIAMENTUM, APPENDICIA, APPENDICIUM, APPENDICULA, APPENDITIA, APPENTINUM, or APPENTITIA. Late Latin words signifying a very small cottage or shed, and consequently frequently meaning, in the plural number, the suburbs of a town. 80.

APPENDIX, or APPENSUM. (Fr. *appendis*.) A late Latin term for an outhouse, or penthouse, as explained by BRITO, in *Vocab. MS.* s. v. *Apheduo*, which is interpreted by appendix as here explained, with the addition that it was called *projectus*, if of wood; *manianus*, if of stone. 80.

APPERTINENCE, not APPURTENANCE as it is frequently written. (It. *appartenenza*; Sp. *pertenencia*; Fr. *appartenance*; Ger. *zugehoer*.) This word, when correctly applied, is used to denote that it is a portion which belongs to a property by nature, right, or appointment; as hamlets to a manor; or a seat in a church to a house; and in this sense the appertinences of a dining room are understood to mean its recess or other arrangement for one or more sideboards, its hot closets, lifts, etc.

APPILLAGIUM. A late Latin word, translated by DUCANGE, *Gloss.* s. v. by the French words *appui*, *pilier boutant*,

in the sense of a strut or shore, but the authority seems doubtful.

APPLE ROOM. There is great diversity of opinion, as observed by LONDON, *Encyc. of Gardening*, 8vo., Lond. 1850, as to the proper method of fitting up an apartment for storing fruit. The use of a large floor, of a grate or stove, and of free circulation of air, is generally allowed to be essential; but authorities are not agreed whether the walls should be fitted up with presses full of shallow open lathed trays, or with shelves for earthen jars. **FRUIT ROOM.**

APPLE-TREE WOOD, see **PYRUS.**

APPLICATION OF THE ORDERS. The technical term for the use of the orders in the decoration of a design, provided that, if there are more orders than one, they are not placed above each other. **ASSEMBLAGE.**

APPLIQUE. A French word adopted in the English language to express an order, or portions of an order, applied to, or as it were stuck upon, any part of an executed design, for no other purpose than display.

APPDIATORIUM. A late Latin word used by LEIBNITIUS, in *Script. Rerum Brunsvic.* fol., Hanov., 1710, ii, 453, for a railing or low screen before a range of stalls, which DUCANGE, *Gloss.*, s. v., translates by the French term *accouloir*, which is also given to the elbows of those stalls.

APPDITIUM PILARIUM. A late Latin word, translated by DUCANGE, *Gloss.*, s. v., by the French term *arc-boutant*, or flying buttress, but his reasons do not appear.

APPENDIAMENTUM. A late Latin term which is considered by DUCANGE, *Gloss.*, s. v., to signify the same as **APPENDIX.**

APPORTIONMENT OF GROUND-RENT. The term applied to the division of a gross ground-rent, into portions corresponding to the number and value of the parts into which an estate may be divided, which requires great judgment that the calculation may not be open to the charge of unduly securing a larger proportion of the gross ground-rent upon certain portions of an estate than upon others. This practice is understood to be usually adopted in speculative building operations, in cases where more erections than one are concerned; the object being to make a profit by the improved ground-rent upon the other portions of the estate, which are thus relieved from their due proportion of the annual payment. By the buildings being usually sold as soon as possible after their commencement, and the granting of direct leases from the freeholder being usually covenanted, the original speculators are relieved from more than a nominal rent in respect of such portions. It does not appear, however, that this object is fully attained, since what is gained in one instance is clearly lost in the other; as the proportion of the gross ground-rent to the gross improved rent is precisely the same; for although, by accumulation in one part, a portion of an estate may remain at a peppercorn, still none of the covenants or rights of the freeholder over that portion are waived or vitiated thereby, but remain in force in every respect. This apportionment of the ground-rent is a point to be provided for, and to which the attention of the freeholder should be especially directed, in the original agreement,—in the first place, no more than one-fifth at most of the net annual value of the house erected should be secured on any individual plot; and in the second place, no portion of his estate should be let at a peppercorn only, because in lapse of time it becomes difficult to preserve the rights or even title of the freeholder over property upon which no rent has been paid; it is even sometimes almost impossible, from the changes resulting from building speculations, to identify at the end of a long lease, property over which the rights of the freeholder have been virtually dormant for a long series of years.

H. B. G.

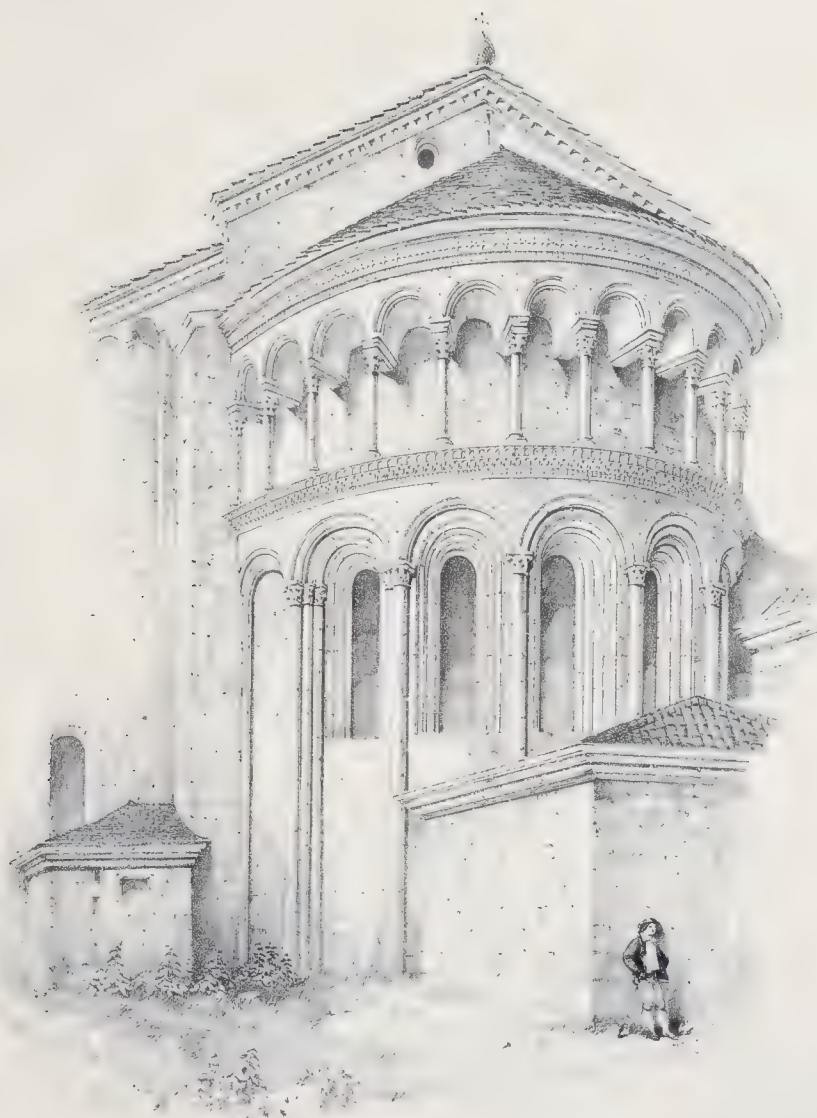
APPOSTA, or APOSTA, see **DESTINA.**

APPRAISEMENT. A statement in writing or figures of the calculated net value of property, if it be a valuation bind-

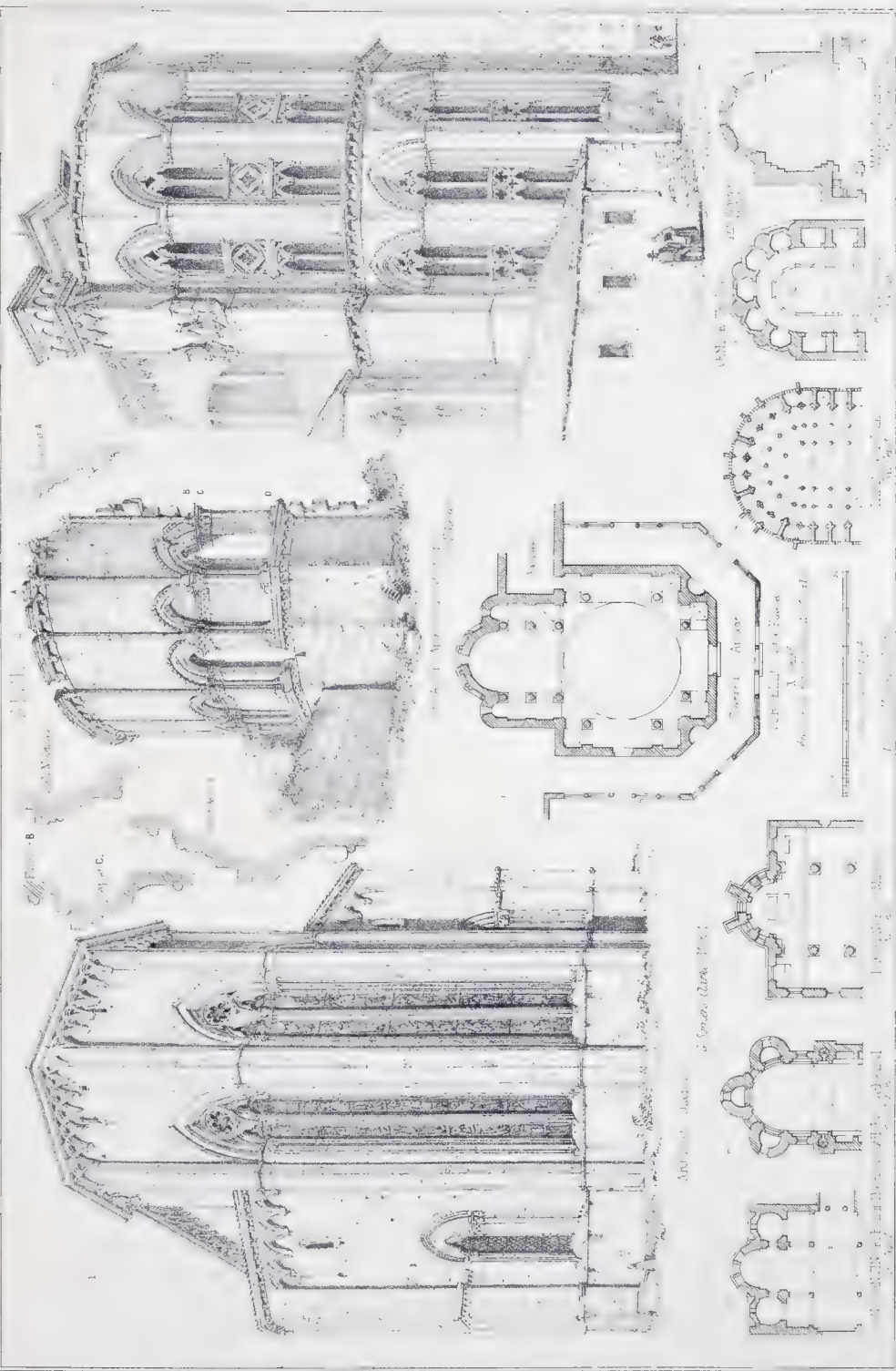
ing, by virtue of enactments or agreements, upon the party for whom it is made.

By the Acts of Parliament 48 Geo. III, c. 149, and 55 Geo. III, c. 184, duties were imposed upon every "appraisement or valuation of any estate or effects, real or personal, heritable or moveable; or of any interest therein; or of the annual value thereof; or of any dilapidations; or of any repairs wanted; or of the materials and labour used or to be used in any buildings; or of any artificer's work whatsoever, excepting appraisements or valuations made in pursuance of the order of the Court of Admiralty or Vice-Admiralty, or of any Court of Appeal from any sentence, adjudication, or judgment of any Court of Admiralty or Vice-Admiralty; and excepting appraisements or valuations of any property, made for the purpose of ascertaining the legacy duty payable in respect thereof." In 1816, the Court of King's Bench held that "the expression valuation or appraisements does not apply to such valuations as are undertaken merely for the private information of the parties interested, and not intended to be obligatory upon them; if a contrary doctrine should be adopted, it would follow as an attendant consequence, that in every case where a person is employed to look over the property of another, and the result of his examination is reduced into writing, that document must not only be stamped, but the valuer himself must take out a license." MAULE and SELWYN, *K. B. Reports*, in Trinity Term, 1816, s. c. Atkinson *vers.* Hill. Professional practice has since followed the opinion there given, in considering an appraisement to be an *authoritative* VALUATION; the same Court having previously held (*Leeds v. Burrows*, 1810; *Perkins v. Potts*, 1814) that when there is an agreement to pay for certain articles, and to refer the question of amount to an arbitrator, referee, or umpire, such valuation as he might report was an appraisement, and not an AWARD within the meaning of the contemporaneous Stamp Act of 46 Geo. III, c. 43, wherein the words differ from those of 55 Geo. III, above given, inasmuch as they state that duties are to be paid upon every piece of paper, etc., "upon which the amount of any valuation or appraisement of any estate, property, or effects, real or personal, or of any interest in possession or reversion, remainder or contingency, in any estate or property, real or personal, shall be written or set down in figures." Hence it is necessary and generally usual for a surveyor who is acting as ARBITRATOR, or making a joint report with a surveyor employed by an adverse interest, or valuing for an affidavit, or for the purposes of administration under a will including the amount of legacy duty, or in any other way in which his authority is final, to take care that he himself be qualified by the possession of a license, and that, if necessary, his report be made upon stamped paper.

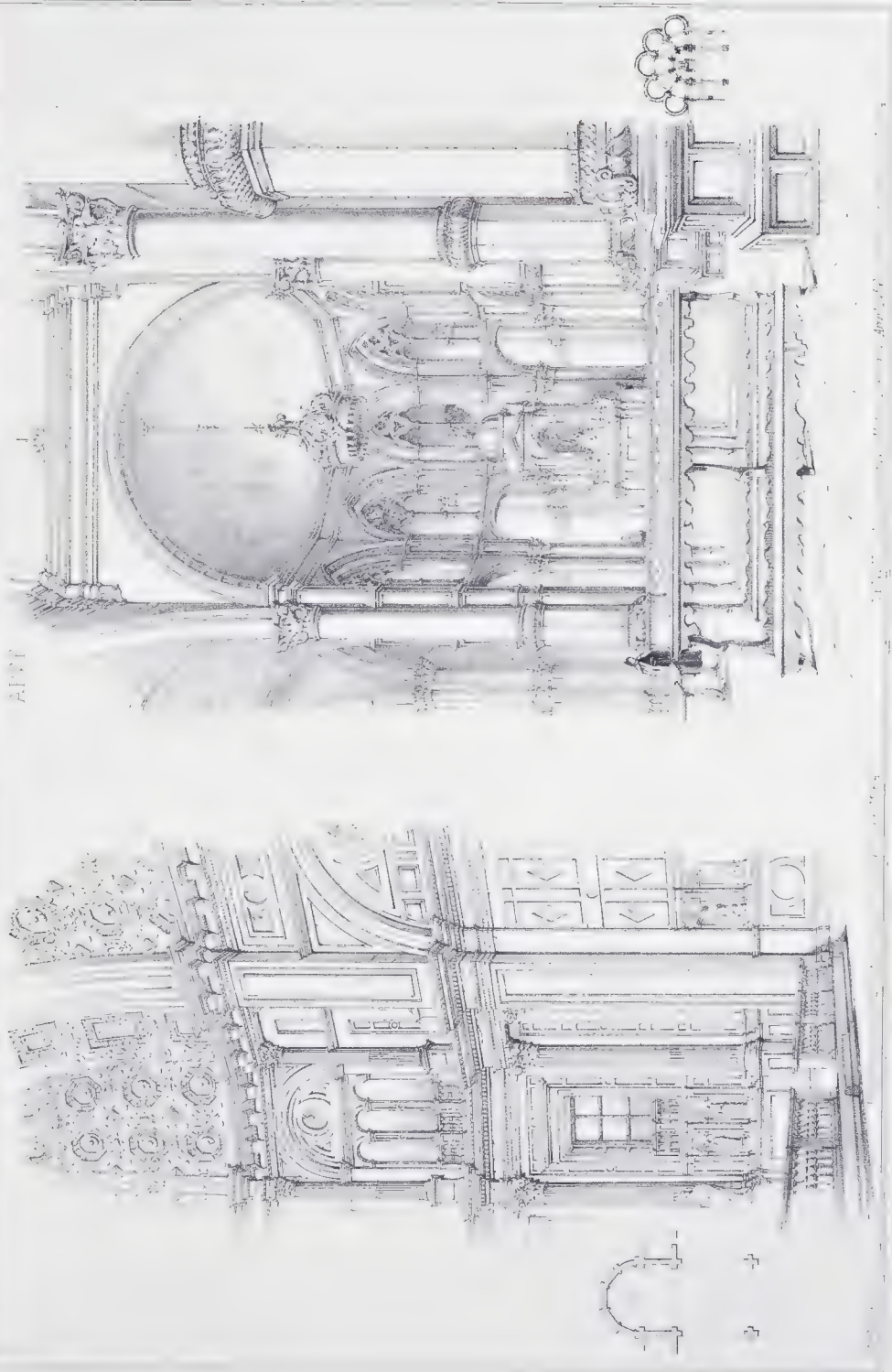
APPRAISER. In the articles APPRAISEMENT, ARBITRATOR, and AWARD, notice will be found of the professional practice of following the opinion of the Court of King's Bench, that an appraiser is a person who makes a valuation which is binding upon the party for whom it is made. This opinion is valuable in respect to the statute of 46 George III, c. 43, in which it is enacted "that every person who shall value or appraise any estate or property real or personal, or any interest in possession or reversion, remainder or contingency in any estate or property real or personal, or any goods, merchandize, or effects of whatsoever kind or description the same may be, for or in expectation of any hire, gain, fee, or reward or valuable consideration to be therefore paid him, shall be deemed and taken to be an appraiser within the provisions of this Act to all intents and purposes"; and further fixes the penalties of £50 for acting without a license; and for not delivering the valuation or appraisement, duly stamped, to the employer, within fourteen days after the making thereof; and of £20, payable by the employer, if he receive, or take, or pay, or make any compensation for the making of any such valuation or appraisement, unless it be duly stamped. This Act has been repealed several times as to the stamps, and the duty upon the license is now £2.

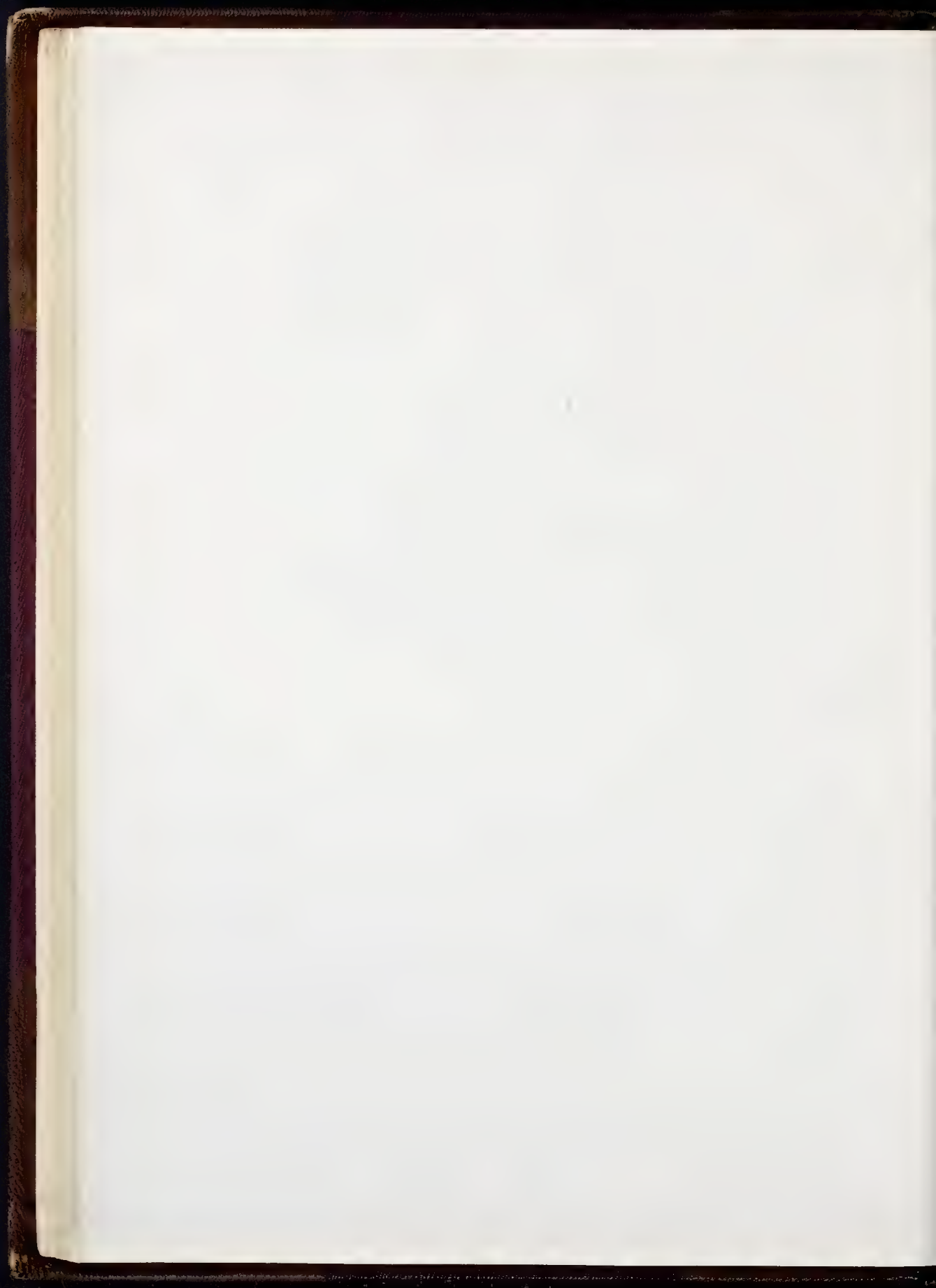


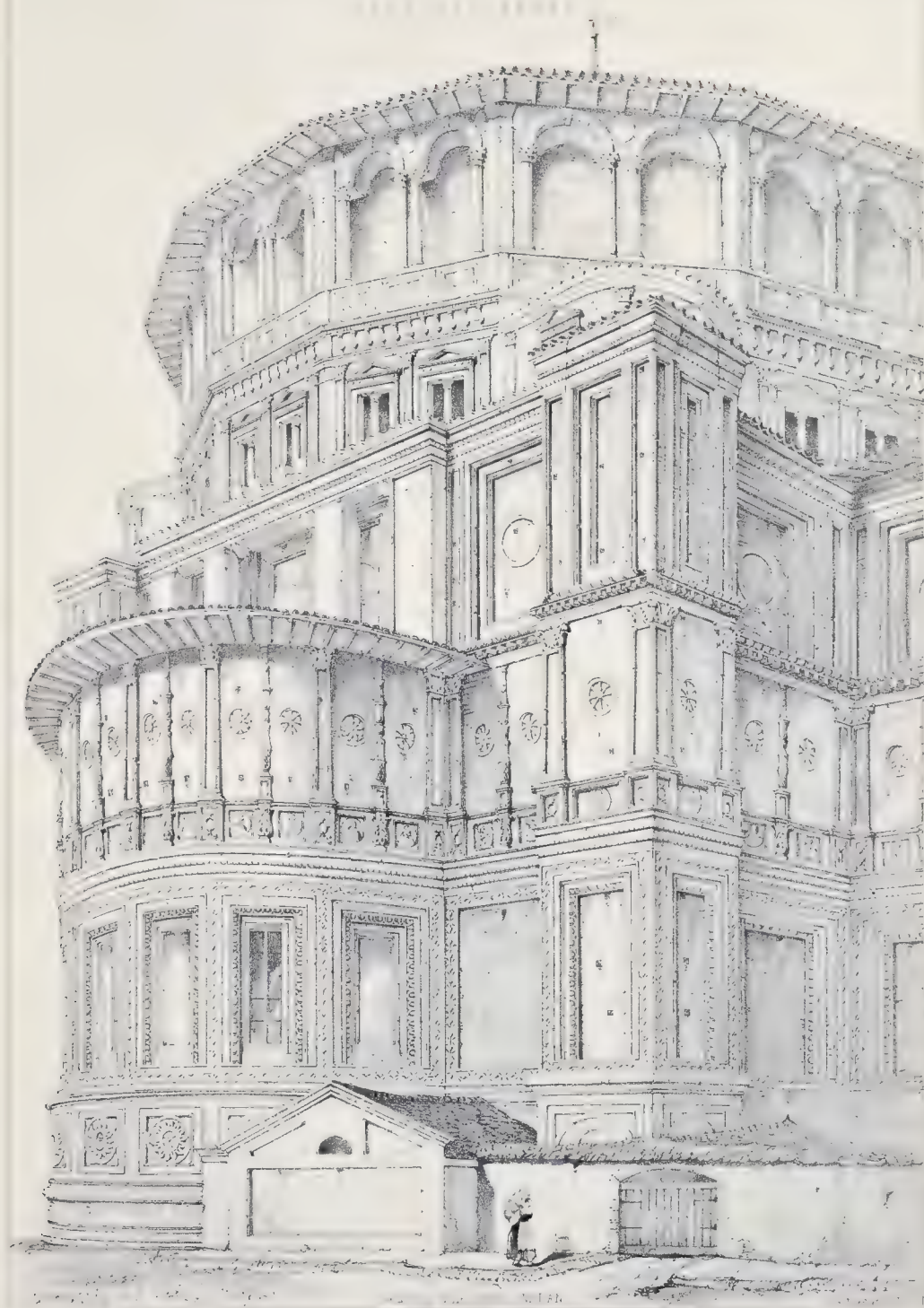














APPRENTICESHIP (Lat. *acconventatio*). The civil, or rather legal, condition of a person bound by written agreement to serve a master for a certain term, receiving in return for his services instruction in his master's profession. The old forms of the contract show that the apprentice was also fed, clothed, and lodged by the master, who sometimes also paid small wages; but at the present time the master commonly receives a premium, and the parents or next friend of the apprentice covenant to provide stipulated necessities. By the Act of Parliament of 5 Eliz. c. 4, the term of seven years was made the law of the land for apprenticeship; but neither that enactment, nor the customs of London and Norwich, cities which were excepted from its operation, forbade a longer term, which it appears sometimes extended to ten years in London. This law was repealed, chiefly through the exertions of the leading mechanical engineers, by the Act of 54 George III, c. 96, so far as respected the qualifications of the persons entitled to take and become apprentices; and the term of years for which such apprentices should become bound; and the mode of binding such apprentices, except that nothing in the new Act should extend to, defeat, alter, or prejudice the customs, etc., of the city of London concerning apprentices, or the ancient customs, etc., of any city, town, corporation, or company lawfully constituted, or any bye-law or regulation of any corporation or company. These restrictions are subject to the Act 3 and 4 Wm. IV, c. 76; but although no longer legally necessary before setting up business, apprenticeship still continues to be the usual mode of learning an occupation, and besides having the influence of custom in its favour, it is recognized by the law, provided that it is strictly by deed indented, and is necessary to the attainment of the freedom of certain guilds and corporations.

The principal points in drawing the indenture of apprenticeship, besides the questions of instruction, board, lodging, apparel, medicine, and wages, are the following: the power of the master (if a member of any guild or corporation) to take an apprentice for a less term than seven years; the restriction of custom as to infancy; and the expression of the whole premium or consideration on the deed (8 Anne, c. 9). The word apprentice should always be carefully inserted. The apprentice is generally restricted from buying or selling with goods belonging to himself or other persons without his master's license; he cannot work for others without that license. An old clause in indentures is supposed to restrain the apprentice from haunting taverns, etc., and from playing at cards, etc.; the part of this clause which prohibited matrimony has been found inoperative. Sometimes the hours of work are fixed. It is usual for a parent or next friend to join in the indentures, so that in all and every the covenants either of the parties binds himself to the other.

The master undertakes at the present day to teach, inform, and instruct, to the best of his skill, knowledge, and ability, or to cause the apprentice to be taught, etc.; in some cases the master simply undertakes to receive the apprentice and give him the opportunity of learning. The apprentice may claim a reasonable sum, according to the nature of the agreement, on the bankruptcy (6 Geo. IV, c. 16) or death of the master (*BUILDER Journal*, 1850, p. 147), if on the death of the master he refuses his consent for an assignment to another master; and this is the only case in which he can be the subject of a *turnover* except by local custom, which requires studying for each particular case, as it often applies in professional apprenticeships, which are chiefly made in large towns. The legal minutiae of stamps, penalties, enrolment, etc., and many clauses affecting various occupations, need not here be noticed. The discharge of an apprentice must be in writing; and it is usual for the master to endorse the indenture with his opinion of the apprentice on returning it to him.

APPROACH. The line to be given to a main road leading to a building; it depends very much upon the style of the edifice. An avenue was formerly considered essential to a grand approach, the object being to render the edifice visible at a

great distance, and so to give importance to it. The avenue was formed to the greatest advantage when the ground was level. At present, the approach to a mansion is almost always made sideways to the house, so as to obtain varied views of the building; and it has been laid down as a rule, that it should be on the same side as the offices and minor buildings, which should not appear as principal, but as subordinate parts: consequently the line, generally winding, to be given to the road (which should never skirt a boundary) between the house and the point of departure from the public road, is one requiring the greatest consideration on the part of the designer, because, though there should be an obvious reason for each curve, yet slight obstacles should not cause a deviation; because the house should not be seen at so great a distance as to lose its importance, and because there should be no apparently possible shorter way after passing the spot at which the mansion is first visible. 8. 58.

APPURTENANCE, more properly **APPURTINENCE**.

APRICOT TREE wood, see **PRUNUS**.

APRON. A piece of lead turned down as a flashing to receive the discharge of water upon any portion of a building; as, for instance, under a gutter passing through a roof but issuing above the level of the eaves, or main gutter. It is also placed under the sills of dormer doors and windows, and to the lower sides of chimney stalks, etc. The name is also given to the platform or flooring of planks at the entrance of a dock: as well as to the ornamental work below the cornice of a **VERANDA**.

APRON-LINING. The facing of the **APRON-PIECE**.

APRON-PIECE, or **PITCHING-PIECE.** The name given to the horizontal beam in a wooden staircase (of two alternate flights, having a half-space between them), which supports the flooring of the half-space or landing, and receives the carriage-pieces, or rough strings and joistings, of the steps. W. H.

APSE (*Gr. ἀψίς*; Lat. *apsis*; It. *apside*, *tribuna*; Sp. and Fr. *abside*; Ger. *tribüne*), called also **CONCHA**, **EXHEDRA**, and in later times **TRIBUNE**. This term is generally derived from *ἀπτομαι*, as signifying connexion, and is properly written **APSIS**; in that sense it was used by the Greeks for a circle, such as the tire of a wheel; and was used by the Romans for a bowl: *ULPIANUS, Dig.*, xxxiv, 2, 20. Passing over various disputed readings of earlier authors, it is clear that, although the word is used by the interpreters of *ISIDORUS*, xv, 8, as signifying "a place of light", with an evident leaning to the Greek word *ἀπσος*, S. *AUGUSTIN, Ep.* 203, *PAULINUS NOLANUS, Ep.* 12, and *SALMA-SIUS, Solinus*, 55, understand by the term a recess, generally semicircular and vaulted over. In the basilica it may have been placed on one side to receive the seat of the magistrate, but subsequently in edifices appropriated to the uses of Christian worshippers, it was put at the end of the building, and contained the seats of the clergy, placed against the wall, with the chair of the bishop raised above the others in the middle. This chair or throne was also called *apsis gradata*; and it has been doubted whether the term was first given to it or to the recess.

The apse then consisted of three parts, the presbytery, the sanctuary, and the choir: the last portion extended, in later times, into the nave. **AMBO.** In front of the throne was the sanctuary, separated from the nave by a railing or screen, being the table standing on a platform called *crepis*, raised on several steps, and under the **CIBORIUM** or *umbraculum altaris*.

The *Glossary*, s. v., observes that the name of *apsis* may also be reasonably applied to all recesses or chapels for altars, whether at the sides or ends of the transepts, nave, choir, or aisles, as the term belongs strictly to a recess which is not carried up high enough to reach the roof, but is not properly applicable where the walls of the apse are high enough to have a ceiling on the same level with that of the building to which the recess opens. Instances of the adoption of a polygonal plan for the apse in France are numerous, while the cathedral of Laon, and the church of Dol in Brittany, are perhaps the only

large churches which, like many parish churches in the provinces formerly under English influence, e.g. Bretagne, Burgundy, Champagne, the Ile-de-France, and Normandy, like most of the parish churches in England, have square apses, for such is the origin of the English CHANCEL. The square apse at Clamecy in France has the aisle continued round it.

The term has been employed not only for the chancel itself, but for the *rond point* and *chevet* of the choirs, and for the semicircular or polygonal chapels attached to them (in the last case they are called *chapelles absidales*), as well as for the chapels recessed like apses out of the transepts and nave, as at Angers cathedral. The Greco-Byzantine churches frequently have an apse at the east end of each aisle, and on the east sides of the transept; such is also the case at Canterbury cathedral, and at the church of S. George de Bocherville in Normandy. An apse at the west end, commonly called a COUNTER APSE, is seen in two churches at Falaise in Normandy, at Nevers, and at Treves.

In the north of France, then, and in Burgundy, the polygonal form is most common, but in the south the semicircular plan was longer prevalent; there the apses rarely have aisles and radiating chapels until the middle of the thirteenth century: but it is observable that the apses of the churches in Provence are generally polygonal in plan, whilst those of more northerly provinces are semicircular. At the end of the eleventh century aisles and radiating chapels circumscribed the apse, as in Auvergne, in Poitou, and in the centre of France, and during the twelfth century this arrangement was extended to Toulouse. Westminster abbey church is a superb example of such an apsidal end with radiating chapels. In the Ile-de-France and in Normandy, with some exceptions, the radiating chapels were rarely used until the end of the thirteenth century, the choir being simply surrounded with aisles, which were sometimes doubled. The apse of S. Denis contains chapels dating from the twelfth century; and there are others in the choir of the church of S. Martin des Champs at Paris, the plan of which presents the peculiarity of a bay larger than the others on the axis of the choir, with a large central chapel. S. Denis, S. Remy at Reims, and the church at Vézelay, present similar instances of that peculiar plan which seems to belong to abbey churches, namely, that the chapels are only segments of circles, of little depth, communicating with each other by a narrow arcade, and thus present a fine appearance.

During the thirteenth century the development of the chapels commenced, as at Amiens, Beauvais, and Rheims; and this was followed by an extension of the great central chapel above mentioned, as at the church of S. Martin des Champs at Paris, and it was generally dedicated to the Virgin. This extension continued during the fourteenth century, and in the fifteenth few churches of any importance were without a lady chapel. VIOLLET-LE-DUC also mentions the double apse at a church at Varen of the twelfth century, and another called "du Thor" at Toulouse (Fig. 1), of the end of the fourteenth century. In the church of Tour near Bayeux (Fig. 2), an indication of the probable existence of another example, of the end of the fourteenth century, may be readily traced.

The system of having the confession or crypt under the apse, in conformity with tradition, tended to cause the level of the apse to be raised above that of the nave and transept. A few useful observations upon the rarity of an early semicircular apse in Wales, Ireland, and Scotland, with conjectures as to the reason, and the substitution

of the square apse or chancel, as at Lincoln, will be found in the *ECCLESIOLOGIST Journal* for 1846, pp. 15 and 80; and the *Glossary*, s. v., may be consulted for a list of the semicircular apses in England. BASILICA. CAMERA. PRESBYTERIUM.

Shrines in which the relics of saints were kept, also had the name apsis given to them, either because they were used in an arch-shaped *arca*, or were kept in the apsis of the church.

The name of apsis has also been given to the *umbraculum altaris* or canopy of the *ciborium*.

For fine examples in *Romano-Byzantin* churches, see BATISSIER, *Éléments d'Archéologie*, 8vo., Paris, 1843, p. 485, and MALLAY, *Les Eglises romaines, etc., du Puy de Dôme*, fol., Moulins, 1838 and 1840; also CIAMPINI, *Vetera Monumenta*, fol., Roma, 1747, and *De Edificiis Sacris*, etc., fol., Roma, 1693; BÉVÉRÉGIUS and VOIGT, *La Disposition des anciennes églises*, reprinted in the *Annales de Philosophie chrétienne*, xvii, p. 420; xix, pp. 346 and 420.

APT (the ancient APTA JULIA). A city in the department of Vaucluse, in France. The walls are considered to be of Roman construction, as also a bridge, of one arch, which spans the Cavalon, a branch of the river Durance. The houses are tolerably well built, and though there are some old narrow streets, there are also many modern ones of good width, and several public fountains. The church (formerly cathedral, for the see was suppressed in 1801) is dedicated to the Virgin and S. Castor, although some authors state that it is under the invocation of Ste. Anne. It is Gothic, without much ornament, decoration being confined to the choir screen, etc. The crypt and subterranean chapels are considered to be exceedingly picturesque and interesting. BOZE, *Histoire d'Apt*, etc., 8vo., Apt, 1813.

APTERAL. A word formed from a Greek compound term, signifying "without wings"; it is applied to any edifice, but more especially to a temple which has not a PTERON, that is, a wing or flank colonnade. TEMPLE.

APULEIUS is recorded in the following inscription: "Templum Dianæ Matri D. D. Apuleius Architectus Substruxit", given by GREUTER, *Corp. Inscr.*, fol., Amst., 1707, pl. xli, fig. 5, from a bronze column at Coruña del Conde (Clunia), in Spain.

APULUM, or ALBA JULIA. The ancient name of WEISSENBURG, CARLSBURG, or ALBA CAROLINA, in Transylvania.

APUZZO (PIETRO D') designed the church of S. Marcellino at Naples. He commenced the works in 1626, and completed them, with all the decorations and the sacristy, in 1633. 36.

AQUARIUM, or AQUARICIUM. The Latin term for a place in which fish were kept; CATO, *De Re Rusticâ*, i, ORDERICUS VITALIS, vi. It was also the name, according to BATISSIER, *Histoire de l'Art*, 8vo., Paris, 1845, 275, given to the great reservoir from which the baths in the Roman thermæ were supplied. In the middle ages, however, the term seems to have been used generally for a pond; and it is at present applied to that part of a conservatory or hothouse which is constructed with cisterns for the reception of exotic aquatic plants. These cisterns were usually about 3 feet deep by 3 feet wide, and 20 feet long, with a perforated steam-pipe placed in a larger pipe running along the whole length at the bottom; but the introduction of the *victoria regia* has altered and increased these dimensions, and has induced the addition of a ripple to the surface of the water by means of a miniature water-wheel.

AQUÆ CALIDÆ, or rather AQUÆ SOLIS, the ancient name of the city now called BATH, in England.

AQUÆ FLAVIÆ (now called CHAVES), a town in Portugal, is celebrated for its Roman bridge, of eighteen arches, over the river Tamega.

AQUÆ GRATIANÆ, the ancient name of AIX-LES-BAINS in Savoy.

AQUÆ SEXTILÆ, the ancient name of AIX in France. An account of a remarkable Roman monument, now destroyed, is given by QUATREMÈRE DE QUINCY, *Dictionnaire*, s. v., AIX, &c., Paris, 1832.

AQUÆ STATIELLÆ, the ancient name of ACQUI in Piedmont.

AQUÆ TAURINÆ. One of the ancient names of ACQUAPENDENTE in the Papal States.

AQUÆ TIBILTANÆ (now called HAMMAM MESROUTIN) in the ancient province of Numidia, is especially mentioned by BARTH, *Wanderungen*, 8vo., Berlin, 1849, as interesting on account of its remains of large Roman thermæ. SHAW, *Travels in Barbary*, etc., 4to., London, 1757.

AQUEDUCT, or AQUÆDUCT, as it was formerly more correctly written (It. *acquidotto*; Sp. *acueducto*; Fr. *aqueduc*; Ger. *wasserleitung*). The term properly applied to the means, not manner, of artificially transporting a continuous stream of water; but the term is generally devoted to fabrics, if not entirely on arcades, yet containing, in some portion or other at least, an important aqueduct-bridge. (See *Detached Essay*, AQUEDUCT.) WATERSUPPLY.

AQUILA. A city in the province of Abruzzo Ultra, in the kingdom of Naples. The walls, about three miles in extent, contain twelve gates; eight are closed up. The castle, built in 1534, was designed by L. P. Scrivano. The streets are generally straight and narrow, and there are but two *places*, both of which are ornamented with fountains. It became a bishopric, removed from Forconio, in 1254, and the cathedral was then dedicated to SS. Maximus and Georgius; the church was rebuilt 1312-1327. The earthquakes of 1703-6, and other destructive causes, have left only twenty-six out of more than a hundred churches which formerly existed; one is dedicated to S. Bernardino, and was built between the years 1525-1542, by Cola dell' Amatrice; another is that of Sta. Caterina della Rnata, built by Ferd. Fuga. There are also sixteen collegiate establishments, eighteen monasteries, eleven convents, and a royal college or *liceo*, transferred from Sulmona in 1816: but the principal edifices are the Palazzo Pubblico, said to have been designed by Marchiruolo; the palazzi Antonelli and Quinzi, respectively built by Sebastiano Cipriani da Norcia and Fontana da Accumoli; an academy; an hospital; a handsome theatre; and some other public buildings. CIRILLO, *Annali della Città dell' Aquila*, etc., 4to., Rome, 1570.

AQUILA. The triangular face included between the horizontal and the sloping cornices of a pediment: the name originated in the very early practice of placing the image of an eagle in the pediments of temples dedicated to Jupiter. The term is used by TACITUS, *Hist.* iii, 71, who accounts for the destruction of the temple of Jupiter Capitolinus, mentioned by VITRUVIUS, iii, 2, as an example of the aræostyle construction, by stating that, when Vespasian besieged the Capitol, the *sustinentes fastigium aquila vetere ligno* caught fire. AËTOS. TYMPANUM.

It is also the late Latin term for a lectern or reading desk, made in the shape of an eagle with extended wings, supported by a pedestal. 23. 79.

AQUILEIA. A city, in the government of Trieste in the Austrian dominions, still retains its ancient name. The old walls were twelve miles in extent, and the splendour of its public buildings may be estimated from the remains of the amphitheatre. In later times it was the sole city of the western Christian Church which enjoyed the dignity of a patriarchate, being counted only second in rank to Rome. Popo, who was patriarch 1019-1042, restored the walls, and erected the magnificent cathedral, under the invocation of the Assumption, with a curious crypt and lofty detached tower of freestone. The see was suppressed about the year 1751, and now the town, even with its fine church, does not equal in importance many a large fishing village. DE RUBEIS, *Monumenta Eccles. Aquil.*; BERTOLI, *Le Antichità d' Aquil.*, fol., Venezia, 1739; CANDIDUS, *Comment. Aquil.*, fol., Venet., 1521.

AQUILONIA. The ancient name of ANGLONA in the kingdom of Naples.

AQUINCUM, now represented by the village of Altöfen in Hungary, still exhibits the remains of a Roman amphitheatre

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calculated to hold eight thousand persons; and of thermæ; with an aqueduct still in use. 28.

AQUINO (the ancient AQUINUM). A city in the province of Terra di Lavoro, in the kingdom of Naples. It was nearly destroyed by the Lombards in the sixth century, and again soon after the death of the emperor Frederick II, in 1250. It still, however, retains the remains of a church (formerly a cathedral until the see was transferred to Pontecorvo), called the *Vescovado*, built of materials from an ancient temple; the adjacent ruins of a triumphal arch, partly of the Corinthian and partly of the Ionic orders, now stand over a stream which runs into the river Liris; a lofty wall of squared stones, without cement or mortar, is part of a temple of the Doric order, which seems to have been about 190 feet long by 60 feet broad, with columns about 4 feet in diameter, according to the portions of shafts and entablature still remaining. A considerable part of the old walls and of the Via Latina; vestiges of a theatre and an amphitheatre; and ruins of several edifices constructed of brickwork, in *opus reticulatum*; as well as of numerous other buildings of various ages and styles, are all deserving of notice.

AQUIS GRANUM, the ancient name of AIX-LA-CHAPELLE.

AQUULA. One of the ancient names of ACQUAPENDENTE in the Papal States.

AR or AHAR, in India, see OODIPORE.

ARA. The Roman term for altar. Under this head, articles with illustrations interesting to the archaeologist and artist, but not within the scope of this work, will be found in RICH, *Illustrated Companion*, 8vo., Lond., 1849, and SMITH, *Dict. of Greek and Roman Antiquities*, 8vo., Lond., 1849. In illustration of a statement at the commencement of the article ALTAR, the following passage may be quoted from SMITH, *Dict. of Greek and Roman Geography*, 8vo., Lond., 1852, s.v. ARÆ Philænorum, viz., "Like such other landmarks erected both to perpetuate a boundary and the memory of some great event which fixed it, these monuments were called altars (see the remarks of STRABO, *Geog.* iii, on such monuments in general)."

ARAB ARCHITECTURE. The most ancient monuments of this style of art do not date beyond the seventh century of our era. They are the mosques of Omar at Jerusalem, 637; of Amru at old Cairo, 642; of Khalif el Walide I at Damascus, 705: which, from numerous repairs, alterations, and reconstructions, have perhaps retained only their names and a portion of their primitive arrangement and ancient materials. If entire they would probably only record that Persian influence which the annals of history show was the fashion at the time of Omar.

This ARABO-PERSIC style was succeeded by imitations of the Greco-Roman and Byzantine edifices which the Mahometans found in the territories overrun by them: thus the style of the mosque of Cordova (786-789) may be called Byzantine or ARABO-BYZANTINE.

Various edifices in Sicily, ranging between the commencement of the tenth and the first part of the twelfth century, generally called SARACENIC, constitute a style different in very many respects from that presented by the Arab edifices in Spain, as they have a greater resemblance to the mosque of Touloun at Cairo (A.D. 877) than to the Arabo-Byzantine mosque at Cordova.

At Seville, from the end of the twelfth century, the horse-shoe arch, and the arch with several foils or lobes, seen in the later portions (A.D. 965) of the mosque at Cordova, alternate with the pointed arch, but still rest upon columns and capitals of an antique style, and form portions of an art which may be called BYZANTINE-SARACENIC (the *Arabe-mauresque* of GIRAULT DE PRANGEY).

The style called ARABO-MOESCO (or more simply *mauresque* by GIRAULT DE PRANGEY) is seen in those works of the Alhambra which date from the year 1248. (See *Detached Essay*, ARAB ARCHITECTURE.)

The division adopted by GWILT, *Encyc.* following LABORDE, *Voy. pitt.*, fol., Paris, 1807-18, presents a different arrange-

ment of the styles of Arabian art; the first period being from the foundation of Islamism to the ninth century; the second to the close of the thirteenth century; and the third to the decline of the Saracen power in Spain, A.D. 1492.

In addition to the works mentioned in the articles ALHAMBRA, SPANISH ARCHITECTURE, etc., are GIRAULT DE PRANGEY, *Monuments arabes d'Egypt*, etc., fol., Paris, 1846; ESCOSURA and VILLA-AMIL, *L'Espagne artistique*, etc., fol., Paris, 1842-50; SWINBURNE, *Travels through Spain*, 4to., Lond., 1779, 8vo., 1787; MURPHY, *The History of the Mahometan Empire in Spain*, etc., 4to., Lond., 1816; COSTE, *Architecture arabe, ou Monuments du Kaire*, fol., Paris, 1824 and 1839.

ARABESQUE (It. *arabesco*, *rabesco*; Sp. *arabesco*; Fr. *arabesque*; Ger. *arabeske*, *laubwerk*). This term has been applied in European languages to the *grotesque* (not *grotesque*) system of decoration, consisting of a capricious mixture of all sorts of fantastic edifices, fragments of architecture, and manufactured articles, with human figures, animals of all kinds, beasts, birds, insects, reptiles, fishes, and mixed with fruit, flowers, foliage, the stems and tendrils of plants arbitrarily entwined, and formed into scrolls or otherwise employed, whether represented by the aid of the chisel or of the brush. But the Accademia della Crusca explains the term *arabesco* as ornaments formed of leaves and flowers, and for the most part drawn with a point, a definition that may appear to have been intended specially to refer to the illuminated manuscripts of the middle ages, and that may seem to justify the inference that in reality the term has no connection with Arabic art, which is forbidden the use of figures, and with which it is connected in most lexicons, but that it simply implies an extremely delicate and minute ornamentation.

Although VITRUVIUS, vii, 5, reprobated with sarcastic severity the excess to which this system of representing impossibilities was carried; yet the *finest* examples exist in the *thermæ* of Titus at Rome, and on the walls of Pompeian houses: the works of Raffaello and his pupils in the *loggie* at the Vatican, and of Giulio (Pippi) Romano in the palazzo del Tè at Mantua, may be cited as successful imitations of the antique practice.

A list of works on such ornament as that of Raffaello, will be found s. v. GROTESQUE. ENTRAYLED. PHRYGIUM OPUS.

ARABO-BYZANTINE (It. *Arabo-byzantino*; Fr. *Arabo-byzantin*). A term expressing, according to GIRAULT DE PRANGEY, *Archit. arabe*, 8vo., Paris, 1841, the second style of ARAB ARCHITECTURE, which existed during the three first centuries of the epoch of the Hegira in the countries occupied by the Arabs after their conquest of Persia.

ARABO-MORESCO or **ARABO-MAURESQUE** (It. *Arabo-moresco*; Sp. *Arabo-morisco*; Fr. *Arabo-mauresque*). A term applied by GIRAULT DE PRANGEY, *Arch. arabe*, 8vo., Paris, 1841, to the third style of ARAB ARCHITECTURE, which is generally called Byzantine-Saracenic: the word Arabo-moresco is often applied by other writers to the fifth or last phase of Arab art, which did not commence till about the year 1248, and is seen in its greatest perfection at the Alhambra in Grenada; this is the *mauresque* of DE PRANGEY.

ARABO-PERSIC (It. *Arabo-perso*; Fr. *Arabo-persan*). A term understood to express the first style of ARAB ARCHITECTURE so far as is known at present.

ARABO-TEDESCO (It. *Arabo-tesesco*; Fr. *Arabo-tesesque*). A term to be understood according to the French and Italian architects as expressing a mixture of the third or fourth styles of ARAB ARCHITECTURE, viz., Byzantine-Saracenic or Saracenic art with German Gothic architecture; the duomo at Florence, commenced in 1290, is cited as an example by DALLAWAY, *Anecdotes*, etc., 8vo., Lond., 1800; and GWILT, *Encyc.*, 8vo., London, 1842, mentions as another the baptistery at Pisa, commenced by Diotis Salvi in 1152.

ARACAN, **ARRACAN**, or **RAKHAIN**. A former capital of the country of the same name, consists of a quadrangular collection of houses which, in consequence of inundations, are

built upon piles leaving about 4 feet between the floor and the ground: these houses are one story high, made of bamboo, and covered with matting. Within the town there is a fort with three concentric quadrangular walls, each 20 feet high; and in the centre of the city four pagodas (STUART, *Dictionary*, s. v. Hindu). The pagodas and the fort are the only buildings in which stone has been employed; for although stone can be procured, its use was forbidden to the owners of private residences. The glittering spires of more than sixty pagodas situated upon the heights surrounding the town, and seen at one view, give a singular and picturesque effect.

AREOMETER. The name which is given to an instrument used to determine the specific gravities of fluid and solid bodies. Its construction resembles that of the HYDROMETER. W. H.

AREOSTYLE. A term derived from the Greek words ἀραιός, rare, and στήλος, column. This is the fifth species in geometric order of intercolumniations described by VITRUVIUS, iii, 2, who without specifying the precise width of the intercolumniations, applied the term to all examples where the columns were more than three diameters apart; consequently the architraves were of wood when stone could not be found of sufficient length or strength for the bearing. The same author states that, to render the weight above as light as possible, the pediments in such cases were filled in with sculptures of terra cotta or bronze gilt, "Tuscanico more". He adds that the columns should be eight diameters in height; but the areostyle portico surrounding the Forum at Pompeii does not illustrate his dictum. This arrangement was peculiarly suited for localities frequented by people in large numbers, as the undefined width of the intercolumn left the designer at liberty to consult both convenience and economy. Four diameters have generally been adopted by modern writers as the standard of this intercolumniation, in conformity with the advice of PERRAULT.

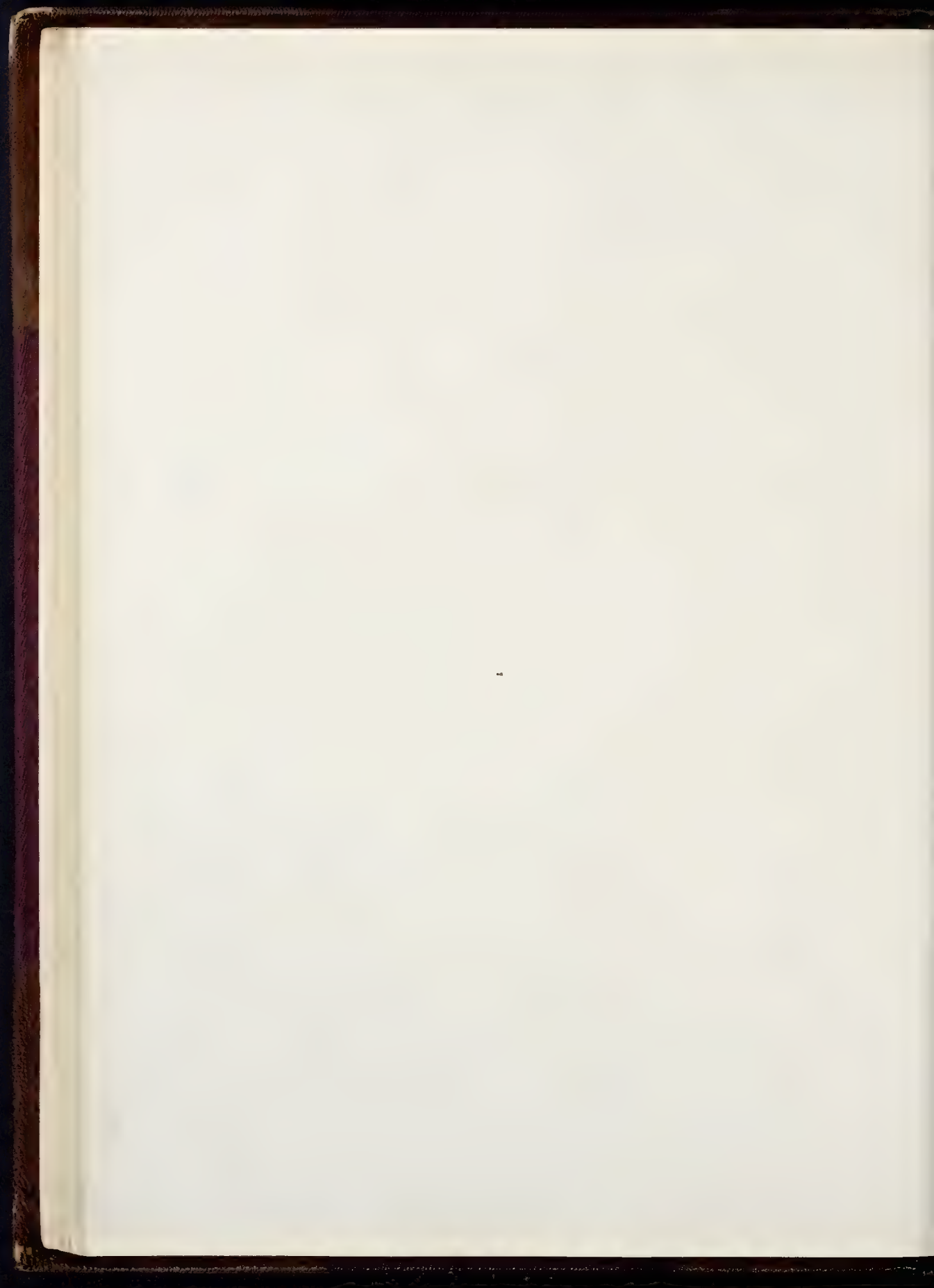
AREOSYSTYLE. The name given by PERRAULT to a manner of coupling columns which admits of large intercolumnar spaces without detriment to the apparent solidity of the edifice. It consists in the employment of two different intercolumniations, one leaving only space enough between the columns for the projection of the two capitals; the other having usually three diameters and a half or more, dependent upon the architect's arrangement of his plan in harmony with his entablature. The invention of this mode of spacing columns has been generally attributed to Perrault, but an example of a similar system of arranging pilasters is to be found in the palazzo of Agostini Chigi in the Via di Lungara at Rome, ascribed to Raffaello, who is recognized as the designer of the Palazzo Stoppani, formerly Caffarelli, in the same city, in which coupled engaged columns are similarly applied, while the entrance to the palazzo Massimi at Rome, by Peruzzi, presents a modern example of detached columns so employed nearly a century previous to the time of Perrault. WOOD and DAWKINS, *Ruins of Palmyra*, fol., London, 1753, plates 3 and 14, exhibit an antique instance of the same system in the interior of the court of the great temple of the Sun.

The Louvre at Paris and the cathedral church of S. Paul in London are the two principal buildings in which this system has been adopted. BLONDEL, *Cours d'Architecture*, fol., Paris, 1698, has devoted several chapters of his first book, part 3, to the consideration of the expense, as using more than double the number of columns requisite if the diastyle arrangement were employed; the irregularities it occasions in the Doric, Corinthian, and Composite entablatures; and its want of real solidity. CHAMBERS, *Treatise on Civil Architecture*, fol., Lond., 1750, has thoroughly investigated the second of these defects, and shown the remedies.

ARA JOVIN. The ancient name of ARANJUEZ in Spain.

ARAMBURU (FRAI MIGUEL DE). A townsman of Cerain, in the province of Guipuzcoa in Spain, a celebrated architect, is mentioned as having undertaken, 2nd Sept. 1597, to





design and superintend the construction of the highly praised church and monastery of the Franciscans at Tolosa. He also designed in 1604 the retablo in the Capilla mayor of that church, and the Casa de Ayuntamiento at Renteria; in 1605, the church and convent of the Holy Trinity in the last named town; in 1606 he received payment for his designs of the church and convent of the Franciscan Nuns of the Conception at Eybar: and is mentioned in 1622 as being then dead. 66.

ARANDA SALAZAR (JUAN DE). A nephew and pupil of Ginés Martínez de Aranda of Santiago. He seems to have settled at first at Madrid, but was appointed, 19 March 1626, to superintend the completion of the great *retablo* in the cathedral at Cordova, which had been begun from the designs of Alonso Matias. He returned to Madrid, and was probably occupied in business there, for in 1634 he was summoned to Jaen, to become maestro-mayor of the works at the cathedral in that city. He destroyed the capilla mayor and other buildings, which were unsuitable to the dignity of the erections designed by his predecessor Valdelvari; built the chapels on the south side and the centre of the church, except the last pillars of the choir, and is not named in the records of the cathedral after 1654. In 1650, he had surveyed and reported on the works at the cathedral of Toledo. 66.

ARANDA (GINÉS MARTINEZ DE), see MARTINEZ DE ARANDA (GINÉS).

ARANDAIA. A wood of Brazil, used for building, etc. 71.

ARANDIA (JUAN DE), apparently a Biscayan by birth, was esteemed a good architect in the style *Gótico-Tedesco*. In 1499 he began, in the monastery of S. Benito el Real at Valladolid, the construction of the nave and aisles, and was at work probably upon the choir in 1526. 66.

A JUAN DE ARANDIA is mentioned as engaged upon the royal works at Toledo in the year 1559. 66.

ARANELLAH. A wood of Travancore, East Indies, of a dark brown colour, used in building common houses. 71.

ARANGUREN (JUAN DE) is mentioned as having been engaged in the year 1562 upon the works at the parish church of Utiel, in the province of New Castile in Spain. 66.

ARANJÍ. A wood of Singapore, used for building purposes. 71.

ARANJUEZ (the Roman ARA JOVIS). A town in the province of New Castile in Spain. The royal residence which it contains was in 1387 the *mesa maestral* of the order of Santiago, but is now a palace, consisting of a square building very much ornamented, with turrets at the four angles, and a large central court. It was originally designed by Juan de Herrera for Philip II; but much was burnt, more taken down, and still more erected, during the reigns of Philip V, and Ferdinand VI, and of Charles III, whose minister Grimaldi, having been at the Hague, founded this rather Dutch-looking town, which consists of several handsome streets, laid out at right-angles with each other, generally with an avenue of trees between the houses. A fine *plaza de Toros*; a public square entered through a marble triumphal arch opposite the entrance to the grounds of the palace which were formed by Charles IV; a noble bridge of stone, built by Charles III; a church and two chapels; several schools; an hospital; an arboretum and zoological garden, supported by the Government; a museum; and a theatre, are worthy of notice, some of the public buildings being well designed. The road from Madrid to Aranjuez, twenty-eight miles in length, was constructed by Ferdinand VI, in the ancient Roman manner, each mile costing £33,250. A very long and detailed account of the town is given s. v. by MADDOX, *Disc. de l'Espana*, 4to., Madrid, 1846. W. H.

ARANZAETROGUI (DOMINGO and JOANES) were engaged from the year 1564 until 1568, in completing the parish church of Renteria, in the province of Guipuzcoa, in Spain. In 1568 Domingo added the belfry, and in 1570 the sacristy. 66.

ARANZALDE (DOMINGO DE) was engaged from the year 1557 until 1562, upon the parish church of Renteria, in the

ARCH. PUB. SOC.

province of Guipuzcoa, in Spain. He raised the pillars of the nave; and died in 1564. 66.

ARANZETA (JUAN DE) competed successfully against Juan de Zaldúa, in 1689, with designs for the *Casa de Ayuntamiento* at Placencia, a town of Guipuzcoa in Spain, which he built, as well as the belfry of the church of the same town in 1703. 66.

ARAPACU and ARAPETIU SEMARELO, are woods of Brazil used for building purposes. 71.

ARASSÆ. The late Latin term for ARRAS HANGINGS.

ARAUCARIA. The name of a genus of gigantic firs indigenous to the tropical climates, and found generally in the Southern hemisphere, which forms majestic and beautiful trees; a few specimens have been brought to perfection in this country. The trunk tapers gradually to the top, having the lateral branches spreading with a graceful bend, at equal distances, towards the top. The araucaria has this distinguishing character, that the cones are terminated by a leafy appendage, and the anthers have many cells.

1. The *A. excelsa*, Norfolk island pine, attains to a height of 200 feet and upwards, with a circumference of 30 ft. In Kew Gardens, London, and the Glasnevin Gardens, Dublin, it has reached 96 feet, but died for want of protection. The wood is white, tough, and close-grained, and contains a great quantity of turpentine. The few trees of this tribe which were felled in New Holland were found diseased at the bottom of the trunk, and under the bark; but the timber, when sound, is well adapted for indoor work, and will vie with the oak for building purposes in usefulness and durability, when a cheap means of transit to this country is found; while its veinings and colour are more beautiful than the oak.

2. *A. imbricata* of South America, also termed *Dombeyi*, is not so graceful as the above, but is more durable and useful for interior and exterior works. It contains a larger proportion of turpentine; and as it requires less protection, it is expected to be naturalized in this country.

3. *A. Brasiliensis* is closely allied to the last-named.

4. *A. Magnatum*, sometimes called *Cunninghami*, of Moreton Bay, is a tree little differing from the first in this list, but exceeds it in height, as it sometimes attains to 270 feet. W. H.

ARAUSIS. The Latin name for ORANGE in France.

ARBALESTENA or ARBALISTERIA, see ARCHERIA.

ARBAN or AARABAN (the ancient ACRAAB). A place on the river Khabour or Chebar in Mesopotamia. It is noticed by LAYARD, *Discoveries*, etc., 8vo., London, 1853, as containing genuine products of Assyrian art, which exhibit an angular treatment and archaic feeling, that convey an impression of remoter antiquity than the works at Nimroud. Scarabæi with the names of the Egyptian monarch Thothmos III (a.c. 1321 of SHARPE) were found in the excavations.

ARBELL (Josef) was engaged with Josef Bojada, after the death, in 1620, of Pedro Blay, in finishing the parish church of the town of Selva, in the province of Catalonia in Spain, which was terminated in 1638. 66.

ARBITRATION and ARBITRATOR. The adjudication, upon any number of matters, by one or more individuals selected and appointed by the parties between whom these matters are actually in controversy. An agreement to refer any future differences, though usually inserted in contracts for buildings, is not considered in law to be binding; and no stranger to an agreement to refer is affected by the decision; a partner does not bind his firm.

The Act of Parliament 5 George IV, c. 96, passed 21 June, 1824, is entitled an Act to consolidate and amend the laws relative to the arbitration of disputes between masters and workmen.

The person appointed to adjudicate is called a referee, but more properly an arbiter or an arbitrator. The doctors of the civil law recognize a difference between the arbitrator and the arbiter (Fr. *arbitre*), which last is bound to judge according to the usages of the law, that is, should be a lawyer, while the arbitrator, *arbitrateur*, or *amicable compositeur* (amicable compounder in the old law books) is authorized, as is the case in France under the present code (1853), not to adhere rigorously to the rules of law, but to decide according to his opinion of the real merits of the case: in France the decision

is without appeal, except in case of irregularity or misconduct. Several persons may be named as arbitrators in a case: if the number be equal, another is usually selected either by themselves, or previously by the parties referring, and appointed to act as umpire. The matter on which the arbitrator or umpire is appointed to adjudicate is said to be submitted to arbitration, or to reference, or to be referred. The decision is technically called an arbitrament, or more usually an AWARD.

When no action has been commenced in a Court, and parties refer their differences to arbitration by agreement, it is in the power of either party to revoke it at any time before the award is made. In order to have a remedy for such a case, it is usual for the parties to unite in an arbitration bond, or agreement upon a stamp, which is called the submission to arbitration, or agreement of submission.

This submission commonly contains a clause to the effect that the parties will abide and perform the award; and if after this either of them should without sufficient reason prevent the arbitrator from proceeding to arbitration,—for instance, by revoking his submission,—he will be liable to an action for a breach of that agreement.

In conformity with 9 and 10 Will. III, c. 15, another clause generally contains an agreement that the submission may be made a rule of any of Her Majesty's Courts of Record; and this submission may at any time afterwards be made a rule of Court by producing the affidavit of its execution made by a witness thereto.

Another clause, to enable an even number of arbitrators to appoint their umpire, unless the umpire be named in the agreement, is requisite; it is best to proceed in the first instance to the nomination of the umpire, who thus hears the entire case, without causing the whole proceedings to be begun afresh on his acceptance of office; but any part of the matter in dispute between the arbitrators may be referred to an umpire, and on such evidence as they may think fit to lay before him.

Another clause might limit the time for decision, by providing that if the referee do not make his award by a day named, either party offering to submit the case to another referee should be at liberty to abandon the previous arbitration.

Other clauses give to the referee the power of deciding the amount of the costs of the award, and the manner and proportion of the payment of those costs and of the costs of the litigation, and in some cases the previous litigation, if any.

The power of summoning witnesses, and of administering oaths (but witnesses may be examined without being sworn, if no objection be made at the time), are cases which also require particular consideration in a submission. The provisions of the 3 and 4 Will. IV, c. 41, apply to arbitrations made under such submissions, as well as to those made by order of a Court, and the law is the same in both cases, except in some few points of practice. Thus the Court, or any judge thereof, is empowered to extend the term for making the award, should that point not have been provided for, can compel the attendance of witnesses and the production of documents, and can give authority to administer the oaths or affirmations required. REFEREE.

The extent of the authority of the arbitrator depends strictly on the terms of the submission; the authority is revoked by the death of any of the parties, unless there be a clause to the contrary in the submission; and the marriage of a female party to the case has the same effect: it also ceases as soon as the arbitrator has made or declared his award; which is known by his giving notice to the parties to apply for it; for afterwards he has not the power, even if the term appointed should not have expired, to correct a mistake.

Under an award, the question at issue is supposed to be decided; but the superior Courts can set it aside, upon application being made within reasonable time, on such grounds as the award not sufficiently answering to the authority, or some other defect obvious on the face of it; or on external evidence (which must be strong) of misconduct, corruption, or mistake

of the arbitrators or umpire; as if they have been misled by fraud; or have proceeded irregularly, as by omitting to give notices of the meeting, or have improperly refused evidence, or committed any gross irregularity.

The defects which at present limit the usefulness of arbitration, will probably soon be the subject of legislative revision. T. T.

Arbitration is sometimes expedient on the grounds of privacy, and is usually made by the judges the mode of determining a dispute in matters of mere account; yet this process can be made tedious and consequently expensive, unless care is taken to select arbitrators and umpire who are disinterested, unacquainted with the matter in dispute except through the information afforded by the witnesses, papers, etc.; and who are competent and willing to bring the matter in dispute to a termination in a given time; and unless care be taken that the arbitrators (and the umpire, if required to decide) agree to the correctness of the draft award, which should be drawn up by a lawyer, and see that it conveys no doubtful meaning, that can be construed other than as a final decision.

An architect is frequently requested to decide points arising in dispute between an employer and a builder, or between two persons engaged in the trades connected with building and employed on the same premises; in such cases the referee generally declines interference, unless the parties address to him a joint promise to adopt his decision. When two architects in adverse interests disagree, it is generally expedient for their clients to request them to adopt the same course of calling in an umpire, the clients formally binding themselves to follow the decision, unless the authority of the agents is indisputable. W. H.

WATSON, *Treatise on the Law of Arbitration and Awards*, 3rd edit., 8vo., London, 1846.

ARBOR. The late Latin term for the branches supporting lights, and proceeding from a globe or other body suspended from a ceiling; OWEN and BLAKEWAY, *Shrewsbury*, ii, 53; or for branches in the shape of a tree placed on the floor of churches, as explained by DUCANGE, s. v., citing S. BERNARD, who calls them candelabra. 2. 23.

ARBORETA or ARBORETUM (Sp. *arboleda*; Fr. *arbrère*). The latter term has been given by LONDON to a garden containing a collection of trees and shrubs, foreign and indigenous, which will endure the climate of the place, and arranged according to genera or localities, with the names placed to each; such as that at Derby, described in the CIVIL ENGINEER, etc., *Journal* for 1841, p. 69. The palm-house placed in many large gardens may also be called an ARBORETUM: but the term is improperly, although frequently, applied to public gardens, etc., which do not contain trees so arranged, or even with the name attached to them.

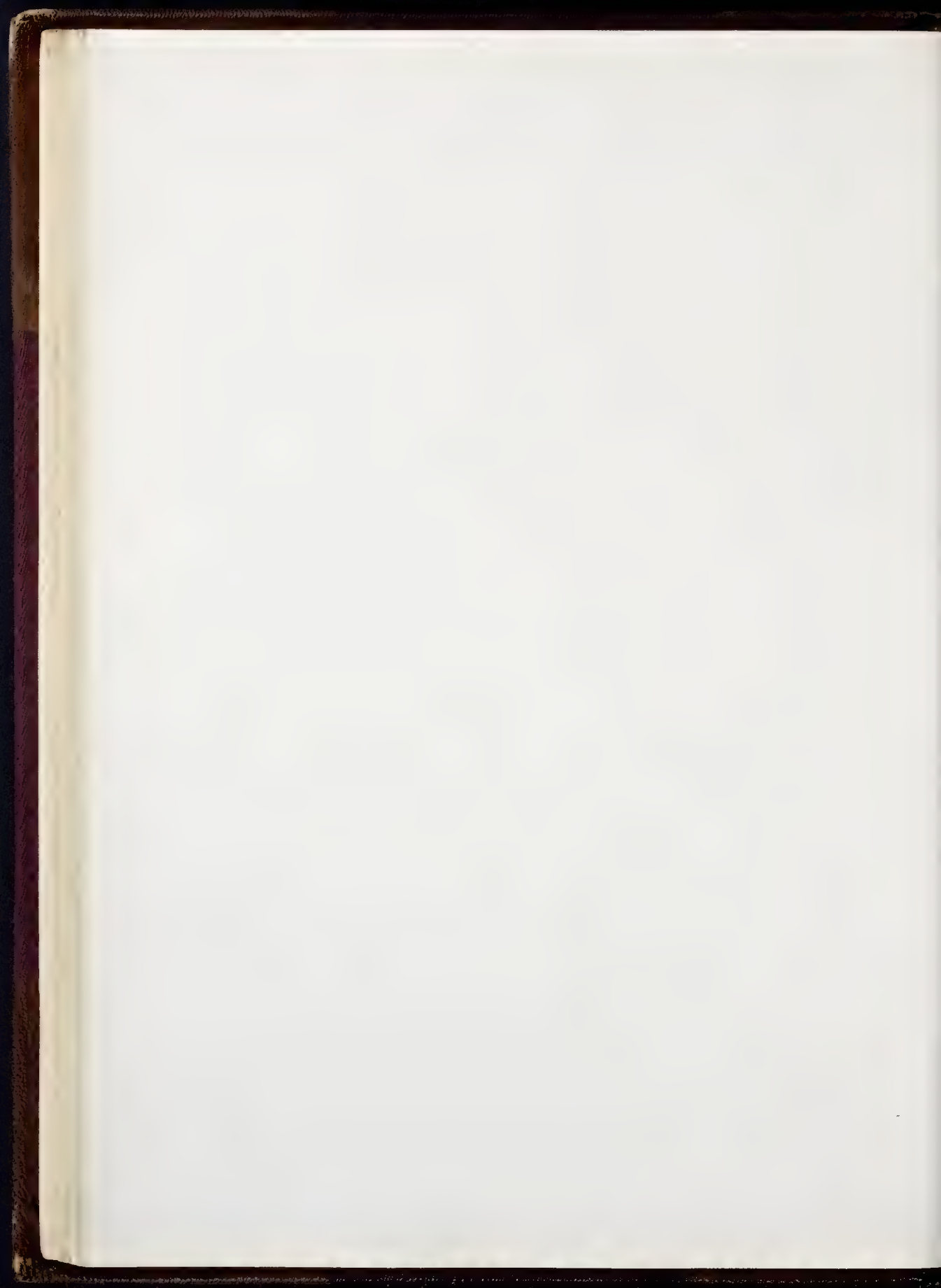
ARBOR-VITÆ, see THUYA.

ARBOUR. A garden building, formerly constructed of timber, lattice work, woven rods, or wickerwork, but now generally of wirework, intended to be covered with climbing plants; it is called French, Italian, etc., according to the style of the outline of the roof. PERGOLA. 58.

ARBUTUS. A genus of evergreen shrubs. *A. unedo*, the strawberry tree, is the most remarkable of the species. It is a native of the south of Europe and the Levant, and proves hardy in Britain, growing to a height of 18 to 20 feet. The most interesting specimens are at the lake of Killarney, where they form groves of great beauty. It is called *kouramía* or *coumaro* in Albania, and forms wood of 10 to 12 inches in diameter, hard, close-grained, and occasionally used for cabinet work. The scarlet arbutus, so named from its deep red flowers, those of the former being greenish yellow, is a much finer species; this, with *A. mucronata*, from the Straits of Magellan, having white blossoms, will endure this climate, and considering their beauty in landscape gardening, they are deserving of cultivation, and of being planted more frequently in large masses. 14. 71.

ARC. The proper term, as distinguished from ARCH, for any curved construction in plastering, wood, or iron work.









ARCADE.

Fig. 1.

Fig.



View of the Church of the
MADONNA DELLA GUARDIA — BOLOGNA.



View of the
PORTA DI SARAGOZZA — BOLOGNA.



View showing the general design of
ARCADE — BOLOGNA.

Edward Hanson del. M. B. A.



ARCA. This word is used by VITRUVIUS, v, 12, for a caisson used in building bridges; but in vi, 3 and 4, for the woodwork of a roof; by FRONTINUS, JULIUS HYGINUS, and SALMASIUS, for a ditch; by AURELIUS VICTOR for a coffin, tomb, or sepulchre, which was also called *loculus*; and by FESTUS and CICERO to a prison or strong cell constructed of oak, in which criminals and slaves were confined. It was also applied to a stall or shop, a treasury, a desk or chest, a shrine, a pyxis, and a coffer. The word is used by the Italians to designate a sepulchral vault; but, according to CANINA, it perhaps properly denotes a mortuary chest or trough with a lid, placed in a crypt or cemetery, and containing the bones of the dead; a very remarkable example, with the particular name, may be seen in the cathedral church at Oviedo: the pages of MARCHESE also frequently recall it in the sense of a receptacle for relics. ARCHA. 80.

ARCADE (Sp. *arcada*; Fr. *arcade*; Ger. *bogengang*). A series of open arches on piers. It may be with or without columns attached to the wall; or on columns only, although in the last case the more appropriate term would be ARCADED COLONNADE. This explanation only refers to the elevation of the wall, and not to any sectional arrangements, although some writers have not scrupled to use the term instead of vault, for a single arched ceiling, or for a space covered by a continuous vault, as the Lowther Arcade in London, which is only a gallery, properly termed by the French architects "*passage*"; or instead of ambulatory or cloister, for the covered space between two arched walls or an arcade and wall. A simple range of arches, if entirely blocked up by masonry or brickwork, is called a BLANK-ARCADE, and if filled in with lights it is called a FALSE-ARCADE. An arcade is occasionally employed round public squares, large courts, markets, and other situations where width of opening is desirable, with considerable advantage on the score of economy, compared with equally wide apertures covered with stone etc., lintels. In Italy, as at Bologna, Modena, Naples, Padua, Turin, Venice, and very many other towns of less importance, the fronts of the houses on each side of many of the streets are supported upon picturesque arcades, which add greatly to the magnificence of the cities; while at Rome the courts of the Vatican, and many other palaces, are surrounded with arcades forming the fronts of cloisters or porticos, under which persons and carriages can wait without being exposed to all weathers. ARCADED PORTICO.

Arcades are often decorated with the different orders of architecture, in which case their proportions vary according to the particular order employed, and according to the absence or presence of pedestals: the last-mentioned condition is seen in a great number of ancient edifices, especially in amphitheatres, where the arcades form the fronts of a continuous gallery, and the pedestal is prolonged to form a balustrade. Sir W. CHAMBERS, *Treatise*, and other writers on this part of architecture, in the chapter devoted to "arches", and to "orders above orders", fully enter into every detail of the decorations of this species of design in Italian architecture.

The term arcade is also applied by many writers to a sort of ornamental dressing to a wall, which is literally a BLANK ARCADE, and is very common in the buildings of the middle ages. INTERLACED AND INTERSECTING MOLDINGS.

Comparative views of arcades belonging to different periods are given in the GLOSSARY, s. v.; by BRITTON, *Chronological History*, 4to., London, 1835; DUCAREL, *Anglo-Norman Antiquities*, fol., London, 1767; and by BAVISSIER, *Eléments d'Archéologie*, 12mo., Paris, 1843; SERGOUX d'AGINCOURT, *History of Art*, etc., fol., London, 1847 (Architecture) p. 13, 42, 45; LENOIR, *Mémoire sur l'Architecture Religieuse*, ii, 40-48; CAUMONT, *Cours d'Antiquités Monumentales*, fol., Caen, 1843.

ARCADE (Fr. *galerie, passage*). A term, as above mentioned, applied to covered streets. One instance in Italy, the Galleria De-Cristoforis by Pizzala, in Milan, may be cited; a few exist in Belgium, and many in France. The Burlington

Arcade was the precursor of all in London; one on the west side of the Italian Opera House; the Lowther; the Exeter; and the Royal, in New Oxford Street; the Royal Arcade at Newcastle, a new one at Huddersfield, and one at Glasgow, are the best known in Great Britain. BAZAAR.

ARCADED COLONNADE. A series of open arches on columns. An early example of segmental arches placed upon columns by the ancients, exists in the apartment called the Egyptian æcus of the house of the Nereids at Pompeii. This innovation upon trabeation was a natural consequence of adopting aræostyle or aræosystyle intercolumniations; and was probably the first step to the abandonment of straight entablatures, and to the support of arches upon columns only: an architectural abuse, as it has been hitherto generally termed, that seems to have begun amongst the Romans about the time of the emperor Titus, and which was afterwards generally practised by nations under the influence of Rome or Byzantium.

ARCADED PORTICO. The name given to that species of PORTICUS or sheltered ambulatory, which is bounded on two or more sides by a series of open arches, either on piers with or without columns attached to the wall, or on columns only. One of the best examples of this manner of building belongs to the church of the Madonna della Guardia, which has long enjoyed great celebrity; and so numerous were the devotees who visited it, that a covered gallery or portico has been constructed, leading from one of the gates of the city of Bologna, called La Porta di Saragozza, to the church itself, which is situated in a commanding situation, on a hill about three miles distant from that city. This extraordinary monument of public spirit and devotion was projected by the Canonico Zeneroli of Pieve di Cento, who presented his memorial on the subject to the senate in 1672. The first stone of the portico was laid 28th June 1674, in the pier between the arches numbered 130 and 131; and the work was carried on by voluntary contributions from the inhabitants, from the corporation and religious communities, and from profits upon theatrical performances, until its completion in 1716.

The portico is twelve feet broad and fifteen feet high, enriched with fresco paintings and numerous inscriptions; it consists of two portions, the Portico di Pianera, and the Portico della Salità; it is not of one unbroken straight line, but follows the irregularities of the country over which it passes; for which purpose, besides inclined planes, there are 514 steps in the extent; the difficulties of the ascent were skilfully overcome by the architects, Gio. Ant. Conti, Torri, Albertoni, and Laghi.

The Porta di Saragozza is the magnificent arch designed by Monti in 1675, as the propylæum or entrance to the Portico di Pianera; and in 1676 the whole of the 306 arches "of the plain" were finished, at a cost of 90,900 scudi (say £22,725). The Portico della Salità is connected with the other by the grand arch called, from the neighbouring torrent, the Arco di Meloncello, built at the cost of the Monti family by Carlo Francesco Dotto, from the designs of Bibiena. From 1676 to 1730 the 329 arches of the ascent were finished, with the fifteen chapels of the Rosary, at an expense of 170,000 scudi (say £42,575); and in 1739 the whole portico was completed, including, from the Porta di Saragozza to the church, 635 arches, covering little less than three miles in length. The three illustrations given in pl. XL, show the entrance next to the city; part of the range of arches, taken at about one-third of its extent from the town; and the pavilion or loggia at which the gallery terminates, forming one end of the church.

Another, but not so important an example, is the portico del Monte Berico at Vicenza, which is a continuous range of arches nearly three-quarters of a mile in length. 28.

ARCAGNA or **ARCAGNUOLO** (L'), see CIONE (ANDREA DI).

ARCARI (GTIROLAMI) built in 1400 the saw mill near the Porta Mulina at Mantua, which is probably the earliest example of such a machine. 28.

ARCBOUTANT, **ARCBUTTANT**, **ARCEBOCEN**, and **ARCHI-**

BOTANT. Old terms for ARCHBUTTRESS, as quoted by WILLIS, *Architectural Nomenclature*, 4to., Cambridge, 1846.

ARCE (JUAN M. DE) see MARTINEZ DE ARCE (JUAN).

ARCELLA. The late Latin term for a small room or closet, and for a chest or coffer.

ARCELLUS or ARCHELLUS (It. *arcèle*; Fr. *arceau*). The late Latin word expressing an archway. 80.

ARCEPS, see ARCHIVUM.

ARCH (It. *arco*; Sp. *arco*, and from the Arabic *alhanga*; Fr. *arche* applied to bridges only, *arc*; Ger. *bogen*). A construction with blocks of any material on the line of some curve in a vertical position, so that the joints if protracted may be in the line of radius of the curvature. The word arch is improperly applied to any overcorbelling horizontal courses of brick or stone which have their angles cut down to a given curvature; FALSE ARCH: or to a curved construction in plastering, wood or iron work, which is properly an ARC.

The supports are called ABUTMENTS or BUTMENTS, PIERS, and COLUMNS, according to their nature. The distance between these is the SPAN of the arch; the points from which the curve commences is the SPRINGING; the line which connects the springing points is the CHORD; and the height from the line of the springing to the top of the curve is the rise or versed sine of the arch. The mould upon which the arch is formed is generally of wood, and is termed the CENTRE or CENTRING.

The blocks are generally supposed to be wedge-shaped and are named VOUSOIRS, or ARCH-STONES and ARCH-BRICKS according to the nature of the material; but they are not always thus shaped, for blocks with parallel beds are sometimes employed with joints that are wedge-shaped, and the shape of the arch then depends upon the mortar or cement.

The blocks at the foot of the arch on each side are the REINS or SPRINGERS, and are generally placed on a platband or impost; the surface of the springer from which the arch is raised is the SKEWBACK; it is generally formed radiating to the nearest centre of curvature, and this radiation is called by old writers the SOMMERING. The portions on each side between the springers and the vertex or CROWN of the arch are the FLANKS or HAUNCHES. The topmost stone containing this vertex or crown is the KEY-STONE, but if of any other material than stone, it is the KEY. KEY COURSE. The under surface of the arch is the INTRADOS or SOFFIT, and the upper surface of the mass above the crown blocks forms the EXTRADOS; the upper surface of the voussoirs is the BACK; whence the materials added on the haunches is the BACKING. The surface above the haunch contained within a line drawn perpendicular to the springing and another horizontally to the crown is the SPANDRIL; the walls built upon the haunches are called SPANDRIL WALLS, and it is usual to carry up such walls at small distances upon the back of arches forming vaults of great depth, and to put small RELIEVING ARCHES from wall to wall where any load is to be carried by the vault. Where a small arch or a lintel crosses a void with a heavy weight above it, a DISCHARGING arch is usually applied, if the abutments be sufficiently secure. It is rarely necessary to specify that the arch is not INVERTED, or that its shape, if it be inverted, is a portion of a circle. A continuous arch forms a VAULT. If the thrust of an arch be balanced by the thrust of another it is styled a COUNTERFORT.

The equilibrium of an arch depends upon every force, to which it is exposed, being resolved in the direction of the radius of the curve to which it is drawn, whether this be attained in the arch itself, or by the counterfort, or by the pier from which it springs retaining it in that direction. Its equilibrium is affected immediately the force acts in a line at an angle to this radius, and is destroyed immediately this force becomes greater than the resistance offered by the counterfort or abutment. For an arch to balance itself, irrespective of the office it has to carry in supporting a weight or resisting a thrust, it is requisite that the catenarian or curve of equal pressure pass within the depth of the voussoirs.

WILKINSON, *Modern Egypt and Thebes*, 8vo., Lond., 1843, ii, 189, mentions one crude brick vault and an elliptic roof at Dayr el Medeenah, near Thebes, as having real arches, of which the date would be about B.C. 1490 of SHARPE's calendar; but as yet no sufficient architectural authority has vouched that the vaults are arches of construction and not of form. This elliptic roofing is sketched in section by HOSKIN, *Travels in Ethiopia*, 4to., London, 1835, p. 352, who (p. 353) gives an outline of a brick semicircular arch lining not attached to the rock, found in a tomb at Thebes, and dating, according to SHARPE, 1321 B.C. A couple of elliptic and slightly skew vaults, apparently arched in four courses, are shown in the great work upon Egypt now publishing by LEPSIUS, i, 89, accompanied by sketches of materials marked with two different names of Ramses II Meamon, which materials seem to have been taken from constructions close to the temple to Amon built at Thebes by that monarch, who reigned from 1900 to 1100 B.C., according to the calendar of SHARPE. Another example at Goorneh, with nine rings to the arch, is given by LEPSIUS, i, 94, but the absence of the appropriate letter-press, which should describe inscriptions dating them, permits at present a suggestion that old materials had been used in perhaps Roman constructions. HOSKIN, p. 73, also mentions two stone segmental arches at Meroe, supposed to date from about 700 B.C., and p. 156, a stone pointed arch of the same date at Gibel Barkal. WILKINSON, i, 357, also considers a stone arch of four rings in Campbell's Tomb at Ghizeh (PERRING, *The Pyramids*, fol., London, 1839), a work of about the year 600 B.C.; and i, 382, cites as an instance of an early arch a lining of thin slabs of stone to a roof at Memphis (HOSKIN, p. 157), or rather Sakkara, ten miles south of Ghizeh, which would date at about the same period; but this is not acknowledged as an arch by WATHEN, *Ancient Egypt*, 8vo., London, 1843, who calls it a lining applied to a concave surface of a rock, and exhibiting no acquaintance with the principle of concentration and mutual compression of wedges.

The antiquity which has been denied at various times to the examples above cited, might perhaps be sustained by the testimony of the paintings at Benihasan (WILKINSON, *Manners*, etc., 8vo., London, 1837, ii, 117), and of the sculptures from the northwest palace at Nimroud, built, according to the lowest calculations, about 700 B.C.; in which clearly defined outlines represent semicircular heads to the gateways of cities, and are supposed to be proved intentions to represent true arch constructions, on account of their ornamented archivolts, and of the discovery by LAYARD (*Discoveries*, 12mo., London, 1851), at the N.E. corner of the southwest palace at Nimroud, dating at least 600 B.C., of a vaulted chamber built of baked bricks.

MUELLER, *Ancient Art*, 8vo., Edinburgh, 1852, observes that as regards the building operations of the Greeks, the art of arching, which was not anywhere employed in temples before 366 B.C., except perhaps in the Eleusinian Megaron, was probably already used in the building of the Odeums, etc. According to the tradition of the ancients it was invented by Democritus (he perhaps only imported it from Italy into Greece); Alexander of Macedon; or Archimedes, in the face of the equally current legends that the Tarquinian princes built the Cloacæ at Rome, particularly the Cloaca Maxima for the Forum; enormous works, in which, even before Democritus, the art of arching by means of cuneiform stones was employed in a quite effectual and excellent manner.

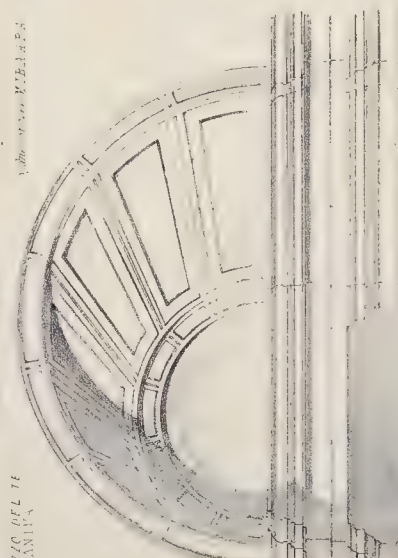
DENNIS, *Cities, etc., of Etruria*, 8vo., London, 1848, i, lxiii; ii, 275, remarks that examples of true arches are not found in connexion with polygonal masonry in Italy, but that they do occur in Greece in such proximity at Æniadæ in Acarnania; at Xerokampo near Sparta, and at Enoanda in the Cibyrtis, north of Lycia; and that in walls of a later date than the polygonal work, the Etruscan gates were arched on the perfect cuneiform system. Yet it will not be surprising to the investigator of this subject, who may be acquainted with the examples

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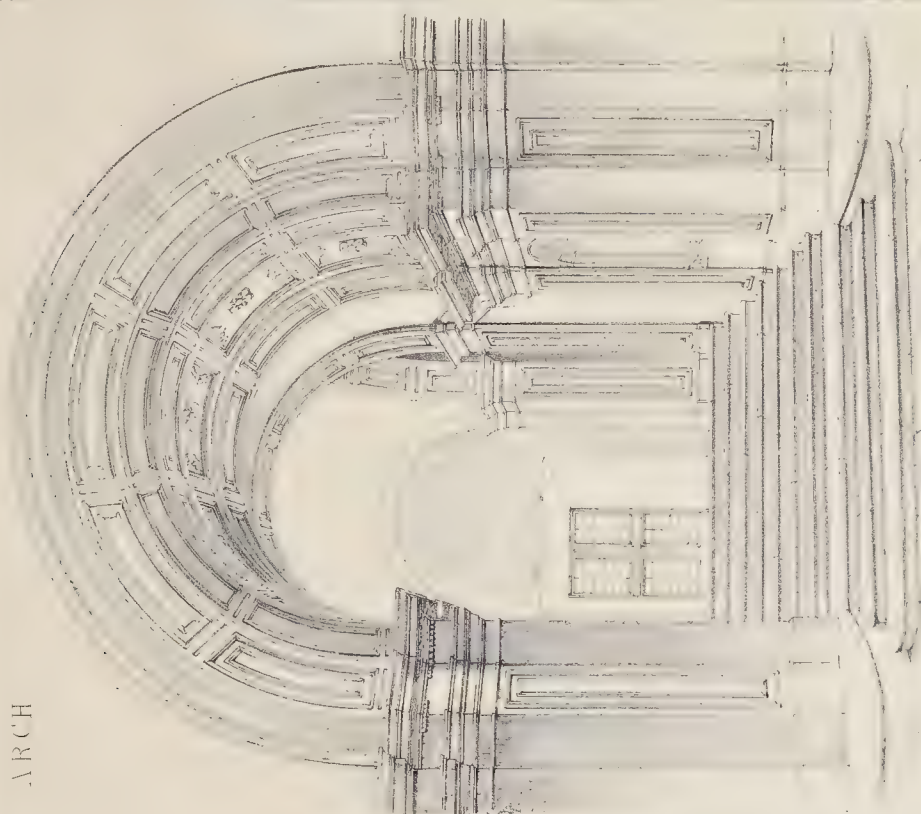
PALAZIO DELLA MANICA

View from the interior



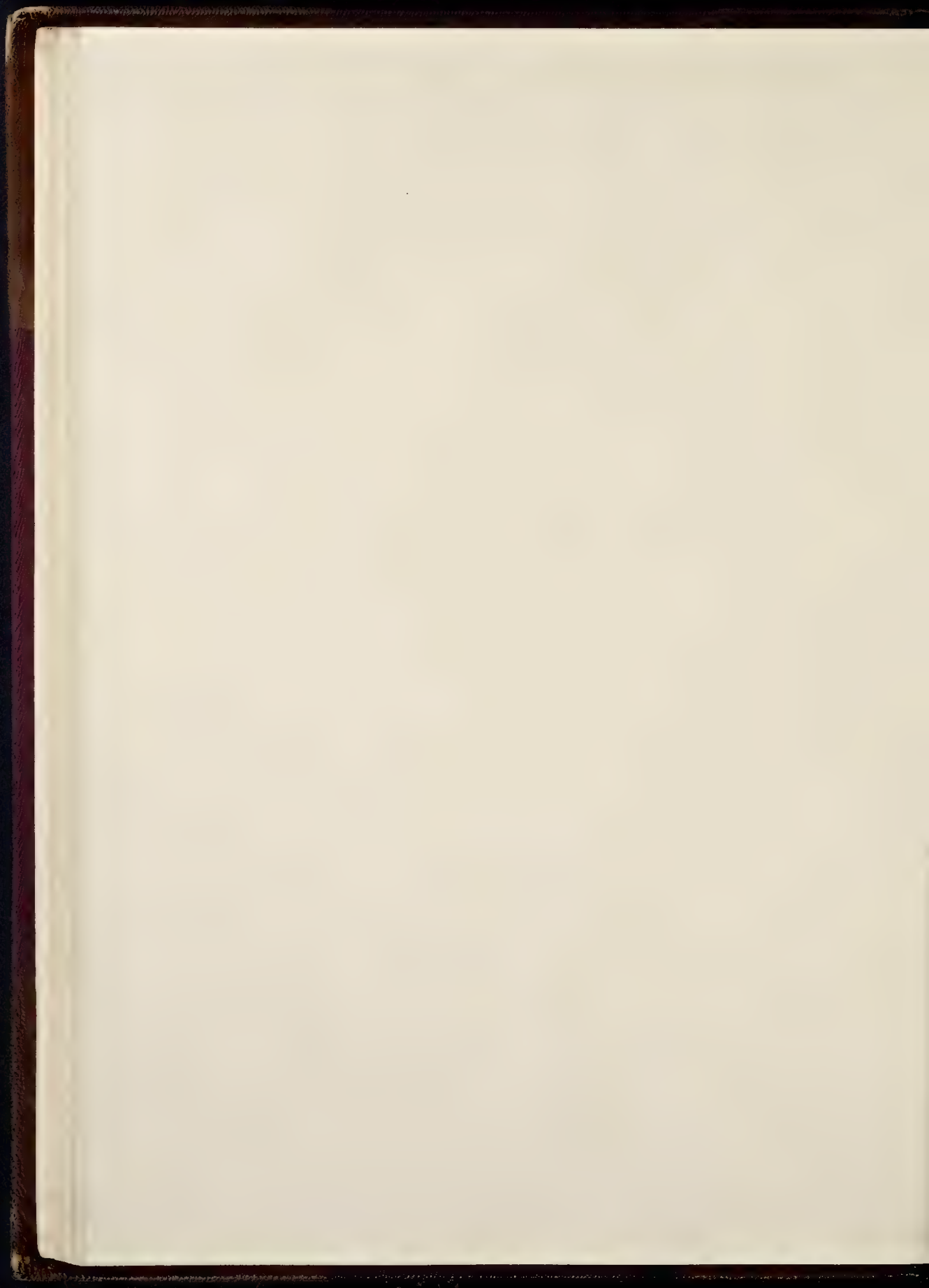
PALAZIO DELLA MANICA

View from the interior



PALAZIO DELLA MANICA

View from the interior



at APERLÆ, to learn that the remains at Xerokampo have been pronounced to be of late date and of Roman construction; that it is also a disputed point whether the Etruscan arches which have been discovered, are works of a date earlier or so early as the cloaca, and that the early date 550 B.C. given to the cloaca, has been met with derision; indeed no ruins of monuments belonging to an age much previous to the Christian era afford a dated example in any country. With whatever people it may have originated, it is clear that the Romans were the first to introduce the general use of the SEMICIRCULAR arch, which in their hands was at an early period a grand but subordinate feature; it soon began to interfere with the architrave, ARCADED COLONNADE, as in the aqueduct and arch of Hadrian at Athens, afterwards compelled the cornice to be subservient, and at length was able to usurp the place of the entablature. When this fashion had gained ground, there was no retreat; the arch placed directly upon the column became a recognized tradition to the builders in the romanesque styles; and was left by them as a canon of construction until their successors, who invented or procured the POINTED arch. The origin and first application of this form has occasioned as much learned and idle conjecture and warfare as the same question in the case of the semicircular arch, and has equally been without any valid results to the theory or practice of architecture.

The usual varieties of the arch will be found among the following heads. BELL; CATENARIAN; CIRCULAR; COMPOSITE or COMPOUND; CONTRASTED; CYCLOIDAL; DEPRESSED; DIMINISHED; DISCHARGING; DROP; ELLIPTIC; ELLIPTICAL POINTED; EQUILATERAL; EQUILIBRIAL; EQUIPOLLENT; EXPANSION; EXTRADOSSED; FLAT; FOILED; FOUR-CENTERED GOTHIC; GROINED; HANSE; HAUNCH; HORSESHOE; HYPERBOLIC; IMPERFECT; INVERTED; LANCET; LOBED; MIXED; MORESQUE or MOORISH; OGEE; PARABOLIC; PERFECT; POINTED; RAKING; RAMPANT; RELIEVING; SEGMENTAL; SEGMENTAL POINTED; SEMICIRCULAR; SCHEME, SCHEME, or SKEEN; SKEW; SLOPING; STILTED; STRAIGHT; SUBBASED; SURMOUNTED; TUDOR; ULNAR.

ATTWOOD, *On the Construction of Arches*, 4to., Lond., 1804; BERARD, *Statique des voûtes*, 4to.; BLAND, *Experimental Essays on Principles of Construction of Arches*, etc., 8vo., Lond., 1839; CRESY, *On the Equilibrium of Arches, Vaults*, etc., fol., Lond., 1839; DERRAND, *L'architecture des voûtes*, fol., Paris, 1643; DUTENS, *Recherches sur le tems le plus reculé de l'usage des voûtes*, 2nd edit., 8vo., Lond., 1807; GWILT, *On the Equilibrium of Arches*, 8vo., Lond., 1826; RENNIE, *On the Expansion of Arches*, 4to.; SALIMBRINI, *degli archi e delle volte*, etc., Verona, 1777; TEMANZA, *degli archi e delle volte*, 1811; WARE, *Treatise on the Properties of Arches*, etc., 8vo., Lond., 1809; the BUILDER, and the CIVIL ENGINEER, etc., *Journals passim*, especially for BARLOW, *On the Construction of Arches*, 1847, and for SNELL, *On the Stability of Arches*, 1848, both in the last named Journal; for other works, see BRIDGE. MASONRY.

ARCHA is found written for ARCA in many of the mediæval Latin writers. ARK.

ARCHÆOLOGY. The science of the investigation of subjects connected with the arts, customs, laws, etc., of former ages.

ARCHÆOPOLIS, in Colchis, see NAKOLAKEVI.

ARCHAISM. A term adopted from the Greek word ἀρχαϊσμός, meaning imitation of the ancients; whence the expression "archaic feeling" is used to signify the taste developed in the early efforts of antique or ancient art.

ARCHANGEL. A seaport town of Russia, the seat of an archbishopric, and of the government of the district. It extends about two miles along the river Dwina, and consists of two main streets, connected by several lanes, very irregular, and paved with wood. The houses are generally well contrived, strongly built of timber, and two stories in height. The principal stone edifices are the Marine hospital and the Gostoina-devor, or exchange, which is a bazaar forming an immense pile of warehouses; it contains a covered ambulatory with offices,

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etc., surrounded by a moat and a high wall, with turrets as watchtowers. There are also several large market places. Only one church is built of stone, ten others are of timber, and for the Greek ritual gorgeously decorated: two churches have been erected by the Protestants. The town also contains a convent, a lyceum or seminary, gymnasium, and naval academy. The admiralty and marine barracks for six thousand men are on Solombalsk island, a mile nearer the sea. Mr. B. Larsky, an engineer lately deceased, while engaged in draining Lake Bolskoi, discovered a submerged forest, a road paved with flints *more romano*, and traces of a bridge with stones corbelled over from pier to pier. ALLISON, *Account of a Voyage*, 8vo., Lond., 1697.

W. H.

ARCH-BAND. The term commonly applied by workmen to that portion of an arch or rib which is seen below the general surface of vaulting. WILLIS, in the *Transactions of the Royal Institute of British Architects*, 4to., London, 1842, mentions that the main arches of a vault, which he terms the transverse ribs, were called by De l'Orme ARCS DOUBLEAUX.

ARCH-BRICK. A wedge-shaped brick employed in the construction of arches. In the northern parts of Italy and Germany, very beautiful specimens are found of the application of moulded arch-bricks; in more southern countries, the employment of bricks of different colours has been generally preferred for the decoration of brick arches.

ARCH-BUTTANT and ARCH-BUTTRESS, ARCHED BUTTRESS or ARCHED BUTMENT (Fr. *arc-boutant*). A term in use till the seventeenth century for a FLYING BUTTRESS, according to WILLIS, *Architectural Nomenclature*, 4to., Camb., 1846.

ARCHED CHANNEL. The channels of the Roman aqueducts were always closed, and were generally vaulted. The New River of London and the aqueduct of Caserta in Naples are open; but experience led to the construction of the Croton aqueduct in the form of an egg-shaped tunnel (see *Detached Essay*, AQUEDUCT).

ARCHEION (Gr. ἀρχεῖον). The Greek term for a public seat of justice, but according to numerous authorities cited by STEPHANUS, *Thes. s. v.*, a record office. It was more particularly applied at Athens to the temple of the Mother of the Gods, in which the decrees of the people and other state-documents were preserved. ÆRARIUM. The Latin term seems to have been very early corrupted into ARCHIVUM.

ARCHER (THOMAS), son of Thomas Archer, M.P. for Warwick, temp. Charles II, was largely employed during the first half of the eighteenth century, though somewhat disparagingly recorded by WALPOLE (whose title of Lord Orford might have been expected by the first Lord Archer, from his family connections by marriage), under the designation of "the groom porter", an office which he held under the monarchs Anne, George I, and George II. Sir John Vanbrugh, surveyor general of the fifty additional churches ordered to be built in the reign of Queen Anne, gave the execution of several of them to his pupils. Amongst these works the church of S. John the Evangelist, in Westminster, was entrusted to Archer. This edifice, begun in 1721, consecrated June 24, 1728, is said to have cost upwards of £40,000. It was originally executed with columns to support the ceiling, but at the reinstatement of the interior of the church, after the fire in 1741, the columns were removed. Galleries were added in 1758, and increased in 1821 by William Inwood. The north and south sides of this edifice present stately porticos of the Roman Doric order, each consisting of two columns *in antis*, with a stone turret at the four extremities of the porticos. The building was originally tied together by iron bars passing through the walls and columns, both external and internal, the former being still retained. In the copy of PENNANT's *London*, illustrated by Crowle, now in the British Museum, is an engraving of the design by Archer for this church, as it was resolved upon by the Commissioners, with an epigraph that "the alterations made since, both to the steps and pinnacles, were done without the consent or know-

ledge" of the architect. A model of this church is also to be seen in the collection at Westminster Abbey, now kept over the monument of King Henry V.

The church of S. Philip at Birmingham, of the Roman Doric order, begun in 1711, consecrated 1715, and finished 1719; the quadrant colonnades at Cliefden House, Buckinghamshire; Mr. Cary's house at Roehampton, 1710; and a garden pavilion in Wrest Park, Bedfordshire, 1709; are given by CAMPBELL, *Vitruvius Britannicus*, vol. i, pl. 10-11, 31-33, 80-81, and vol. ii, pl. 70-74, as works executed by Archer, to whom Walpole likewise attributes Heythorpe or Haythorpe, in Oxfordshire (executed about 1705, NEALE, *Seats*, etc., 4to., Lond., 1822, vol. iii), given by WOOLFE and GANDON, *Vit. Brit.*, vol. ii, pl. 82-85. The royal collection of maps, etc., in the British Museum, xviii, 18 f, contains a plan for the proposed church of S. Paul at Deptford near London (another of the fifty churches above alluded to), inscribed "Mr. Archer, archite", being the first sketch of a series of plans, in which the portico is considerably altered. The ground was purchased in 1712, and the church consecrated 30th June, 1730. Umberslade in Warwickshire, the seat of the family, may also be attributed to Thomas, it having been rebuilt, before 1741, by his brother Andrew, father of the first Lord Archer, whose title, created in 1747, became extinct in 1778. The GENTLEMAN'S MAGAZINE for May 1743, records the decease s. p. "on the 23d May, of Thomas Archer, Esq., Groom Porter", who must then have attained an advanced age.

G. B.

ARCHERIA (Fr. *archière*). A term which it is very difficult to separate from arbalestena or arbalisteria, although they are coupled in an extract given by DUCANGE, *Gloss.*, s. v., "Archeriam nec arbalisteriam nec cornelium, neque scutum", unless one of the words be understood, in accordance with a passage in the *Gesta Ludovici VII, Reg. Franc.*, to mean a very long narrow aperture, fitted (without any transverse opening) for the discharge of a long-bow, which would require a very much splayed arrière voussure or rearvault; while the other is presumed to mean an aperture, with a cross slit or other opening in its jambs, so prepared in the interior of the wall as to be fit for the discharge of an arbalest or cross-bow, which would require a wide splay of the embrasures, but no very great height between the sill and the head of the window. MEYRICK, *Anc. Arm.* iii, *Gloss.*

ARCHERIA was also used for the cottage of a farmer having two cows: the French word *archille* expresses a dwelling-room next a cow-house.

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ARCHETUS. A late Latin word, explained by DUCANGE, *Gloss.*, s. v., as meaning a mason's saw and a skeleton key, but used by MURATORI, *Chron. Parm.* ix, 822, for a CRANE.

ARCHIA. The late Latin term for the arch of a bridge, preserved in the French word *arche*, which is only used for such arches.

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ARCHIAS of Corinth is mentioned by MOSCHION as the architect placed at the head of all the artists and artificers employed on the celebrated ship built by Hiero II of Syracuse (B.C. 270-216), whose public works of great magnificence, as well of real utility, among which are mentioned temples, gymnasia, and porticos, are generally presumed to have also been the works of Archias. ATHENÆUS, v; DIODORUS, xvi.

ARCHIBANCUS. A late Latin word, which DUCANGE, *Gloss.*, s. v., translates by the term ARMARIUM.

ARCHIBOTANT, see ARC BOUTANT.

ARCHIBUS, see ARCHIVUM.

ARCHIEPISCOPAL PALACE (It. *arcivescovado*; Sp. *arzobispado*; Fr. *archevêché*). The dwelling of an archbishop. The general requirements of such a residence will be found in the article EPISCOPAL palace: it will be sufficient here to mention that at Evreux, given by TAYLOR, etc., *Voy. Pitt.*, fol., Paris, 1820, Normandy, p. 225; and that at Liège, in VAN KEMPEN, *Vues*, etc.; and HAGHE, *Sketches*, etc. LASSUS and VIOLET LE DUC, *Rapport sur les Reparations à faire à l'église*

Notre Dame, 4to., Paris, 1843, have given a plan of the old palace in Paris.

ARCHIFRON and ARCIFRON are improperly written in some copies of STRABO, *Geog.*, for CHERSIPHON.

ARCHIN, see ARSCINE.

ARCHINALE. A term used by old English writers for ARSENAL.

ARCHIOLI (RAFAEL DE) is mentioned as engaged on the royal apartments at the convent of Abrojo in Castile, in 1551, and on the fortress of Simanca, in the same province, in 1554. 66.

ARCHISTERIUM. A late Latin word, generally supposed to be a corruption of asceterium, and therefore to mean a convent.

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ARCHITECT (It. *architetto*; Sp. *arquitecto*; Fr. *architecte*; Ger. *architekt*). The derivation of this term from the Greek words *ἀρχις* a chief, and *τέκτων* a workman, leads to the inference that at the time of the invention of the compound word, the design and construction of an edifice devolved upon one individual, who was considered as the master-builder. It appears extraordinary that mention is not made by the classic authors of any architects in ancient Italy previous to B.C. 200 (COSTIUS), although such artists must have existed prior to the introduction of Etruscan art into Rome by the builders of the Cloaca Maxima; but the information, especially as to REWARDS and PUNISHMENTS, to be derived from the monuments and traditions of ancient art, shows that the modern designer, contractor, clerk of the works, and most skilful artisan, were represented by one and the same individual. Both in Greece and Italy, an architect was an artist-professor of philosophical and practical mathematics and mechanics; and from the earliest times the functions of civil and military engineer, as now understood, were material portions of his duty: such was the case with the Italian artists of the fifteenth and following centuries, who superadded excellence in sculpture and painting; and who certainly made their fortifications, whether Italian or Gothic, wonderfully picturesque. It is scarcely necessary to observe that modern military architecture is designed by the engineer.

In the decline of classic Roman art, architects are sometimes mentioned as designing works of which they were not to superintend the execution; but such cases seem to have been isolated instances, from the testimonies of later authors, in whose time, as previously, the architect or master-builder was checked by a resident board, or by a comptroller of the expense, who was sometimes a person of high rank in the household or in the army (DINOCRATES) of the prince; sometimes a senator (C. PLINIUS *secundus*), or an officer of the municipality or province in which the work was to be executed.

Notice should be taken of the immense number of practitioners recorded by POLYBIUS, v, 9, who mentions that Ptolemy Philopator sent one hundred architects to Rhodes; and by JOSEPHUS, who states that for the third temple at Jerusalem, Herod supplied a thousand priests expert in building, and ten times that number of workmen; yet the testimony of SPARTIAN as to the confession of the architects at the beginning of the fourth century of their inability to repeat the execution of the *cella solaris* of the thermæ of Carracalla, agrees with the statement that at the same period, the impatience of Constantine soon discovered that, in the decline of the arts, the skill as well as numbers of his architects bore a very unequal proportion to the greatness of his designs. The magistrates of the most distant provinces were therefore directed to institute schools, to appoint professors, and by the hopes of rewards and privileges, to engage in the study and practice of architecture a sufficient number of ingenious youths who had received a liberal education. *Codex Theodos.*, xiii, title 4. This law is dated in the year 334, and was addressed to the prefect of Italy, whose jurisdiction extended over Africa. The commentary of GODEFROY on the whole title well deserves to be consulted." GIBBON, *History*, etc., 4to., London, 1776. Apparently in consequence of this energetic measure, there were seven hundred architects at Rome

at the beginning of the fifth century, according to VEGETIUS; and at the beginning of the sixth century five hundred architects, who seem to have been, like ANTHEMIUS, called from all countries, were in the service of Justinian, if PROCOPIUS be correct; for the anonymous author quoted by GYLIUS asserts that at the beginning of the seventh century, when the aqueduct of Valens at Constantinople was damaged, Heraclius procured a thousand builders with their subordinates, over whom there presided a nobleman and some of the principal men of the city as surveyors of the works. Those individuals who have generally been quoted as architects, such as ÆTHERIUS, APHRODISIUS, AURENTIUS, and others, and who from their rank may have been only comptrollers, will be found mentioned under their separate articles. The inscriptions upon Mahometan edifices generally mention only the names of the ruling prince, and of the subordinate official under whom the work was executed; those names which are acknowledged to belong to the designers of the works, will be found at the end of this article.

While the monasteries contained the only persons capable of designing buildings, the regular clergy were, or are supposed to have been, the artists who directed the mechanical labours of such artizans as they could procure, and of the members of their own bodies, as is known to have been the case at Dunes in Flanders (Cistercian), and Sta. Maria Novella in Florence (Dominican). During very many centuries the cloister produced celebrated artists; and those individuals who have generally been quoted as architects, such as Abbot AMELIUS and others, but who, on the grounds of being recorded in the chronicles as having built certain edifices, may have been only comptrollers, will be found mentioned under their separate articles, for the records show that in some monasteries the abbot or prior was occasionally elected on account of his skill in building.

As soon as the laity began to study the geometry of the ancients, the INGENIATOR was again the architect resident at the works in course of construction. HARTSHORNE, *Archeologia Cambrensis*, 8vo., London, 1850. The English Close Rolls for the thirteenth and fourteenth centuries (especially those of Henry III., regarding Edward Fitz-Odo the goldsmith), together with the Italian documents of the fourteenth and fifteenth centuries, at Florence, Milan, and Orvieto, and those given by CIOGNARA, *Storia della Scultura*, fol., Prato, 1823, show that in the respective countries the system of providing a resident comptroller of expense had been revived. There are only some hints of such a system in France; thus Hugues Aubriot, treasurer of the finances and provost of the merchants of Paris, is recorded as the *builder* of the Bastille, in 1369, for Charles V; and there are several notices of such an arrangement in Germany and Spain.

At the palace of Westminster in 1364, besides the *custos* or warden of the building, a complete government or royal establishment, under the treasurer, consisted of four persons, viz., A, the *clericus operationum*, who was not the modern clerk of the works, but the director and supervisor (in English, surveyor); this officer paid the bills or passed the accounts with the Treasury; "on the testimony and view" of B, the contrarotulator, comptroller, or clerk of the accounts; under whom were C, the supervisor, or as he is sometimes called, the *provisor* (which may be rendered purveyor), who found, as and where he could, the requisite materials and workmen; and D, the surveyor of the labourers and keeper of the tools. In that year these officers respectively received £18:4:0, £9:2:0, £6:16:0, and £5:4:0, per annum. In their duties, the architect or surveyor; the chief clerk; the clerk of the works; and the labourer in trust, of the late Government Board of Works in London, may be easily recognized. Those officers of such establishments who have generally been quoted as architects, such as ARDERNE and others, and those who from their titles may have been only subordinates, will be found mentioned

under their separate articles in conformity with evidence that a regular system of promotion was observed.

BRITTON and BRATLEY, *History of the Ancient Palace of Westminster*, 8vo., London, 1836, may be consulted for the comparative remuneration given to the officers above named, and to their workmen, from the year 1291 to 1364.

MARCHESE, *Lives*, etc., 8vo., Dublin, 1852, mentions that in the obituaries of the Benedictine order, the usual titles of the architect in 1250-1350 were *magister lapidum*, *carpentarius* (*lignarius* being used for the carpenter), and *architectus*. In Germany the title of *baumeister* seems to have been given to architects, which is continued to the present time, as well as to the heads of the *GUILDS* or lodges (*huetten*) of the masons. In Spain the presiding builder was generally recorded as the *maestro*, or *maestro-mayor*, and sometimes *APAREJADOR*; but it is clear that these titles were soon appropriated respectively to an architect (sometimes, but not always resident), and to his assistant surveyor, or clerk of the works, who was always upon the spot controlling the operations of the tradesmen working, by contract or otherwise, for a deputation of capitular bodies, or of provincial assemblies, or for the treasurer of the prince. In Italy the records give various names to the persons who are mentioned in the lists of architects; *ingegnere* being generally the equivalent for *architetto*, a word which does not occur in the roll at Orvieto until the year 1508: and it may be well to observe that the Latin term *operarii*, generally rendered *wardens* of a building, is properly applied to the *collegio* or board of comptrollers, such as still exists for the works of the church of Sta. Maria del Fiore at Florence. FRANCHETTI, *Storia del Duomo di Milano*, fol., Milan, 1821; DELLA VALLE, *Storia del Duomo di Orvieto*, 4to., Rome, 1791; and MATAS, *Descrizione*, etc., fol., Florence, 1843.

A great point of difference between the architects of classic and mediæval times, has appeared to several writers to have been that arithmetical systems were pursued by the first, while the use of descriptive geometry influenced the practice of the latter. Until the death of M. A. Buonarroti (1559), or perhaps a little later, the professor of pure geometry, whether also architect, painter, sculptor, or theologian, was employed as a civil and military engineer (SAN-MICHELE). After that time the competition became so great, that as previous practical employment was the chief recommendation when works of fortification, hydraulics, or machinery were in question, those occupations were no longer combined.

At the end of the sixteenth century the land-surveyor began to claim a position independent of the architect, who was thus restricted to be an artist (sometimes also, as previously, a painter and sculptor), and designed edifices which were executed under his inspection, if he were possessed of an official station, or if he were the master builder, but which were almost as often executed by others without his superintendence. This was chiefly the case in the sixteenth and two following centuries, when a resident clerk of the works, as he would now be called, was employed to fulfil all the duties of an architect except that of giving the first design: thus in the instance of Heriot's Hospital at Edinburgh, supposed to be the design of Inigo Jones, William Aytoun bound himself in 1631 to the governors, to "devyse, plott, and sett downe quhat he sall think meetest for the decorment of the said work and pattern thereof, and alreddie begun, where any defect beis fund, and to mak with his awin hands the haill mewildis as weil of tynber as of stane, and prosecute and follow forth the modell fram and building of the said wark." The existence of these *surveyors* rendered the condition of MASTER BUILDER as a monopolist almost impossible: even so late as the year 1800, the architect laid his drawings before a meeting of the several masters of each trade whom he was about to employ, and discussed with them the whole division and arrangement of the work, a custom which produced the manner in which specifications are still drawn up. The architects at the end of the eighteenth century in England,

being almost without exception, more or less openly contractors for the execution of their works, induced the competition of builders who designed for themselves; which was accompanied by bad work and worse taste, followed by the system of large contracts.

In the modern acceptance of the term, an architect is one who both furnishes the designs and superintends the erection of buildings; he therefore represents the artist and the man of science combined in one individual. However graceful and artistic the designs which the architect may produce, he is at best but a mere draughtsman, unless he possesses the practical knowledge necessary to enable him to carry them into effect; while the builder, who may have ability and experience sufficient to erect an ordinary building planned by himself, cannot with any propriety assume the title of architect unless he also exhibit taste, invention, and a thorough acquaintance with the style he may have adopted. To acquire a leading position in his profession, the architect must display integrity, and refined manners, combined with the various acquirements indicated in the article ARCHITECTURE, and the especial advantages of favourable opportunities. VITRUVIUS, MILIZIA, and Sir Wm. CHAMBERS, are the chief authorities to be consulted on the character and studies of the architect; the remarks of the last named writer in particular are deserving of attention, as the most judicious and practical that have appeared, while they are applicable in every respect to the present time.

Essay on the Qualifications and Duties of an Architect, etc., 8vo., London, 1773; MICHA and REMONT, *Code Belge des Architectes et Entrepreneurs de Constructions*, etc., 8vo., Liège, 1840; VITTORE, *Istruzioni Diverse concernenti l'Officio dell'Architetto Civile*, etc., 4to., Lugano, 1767; WIGHTWICK, *Hints to Young Architects*, 8vo., London, 1846. A lecture by Professor DONALDSON, prefixed to *Architectural Maxims and Theorems*, 8vo., London, 1847, enters largely into the consideration of the attainments and duties of an architect.

Many authors, as VASARI, FELIBIEN, MILIZIA, STUART, GWILT, COCKERELL copied in the *CIVIL ENGINEER Journal*, vi, p. 94, 4to., London; and LEEDS, in vol. iii of the same work, p. 183, etc., give lists of architects in most of the styles except those of Arab architecture, and as the list is small, if those only be mentioned who are recorded in Mahometan writings with the express epithet of architect or master builder, those who may be recognized as having directed the workmen are here placed in a list chronologically arranged, and information as to their dates, works, etc., will be found in the articles under their names, viz., SENNAMAR; JACOU; (ABDERRAHMAN I is said to have himself designed the mosque at Cordova, commenced by him in the year 786. CONDE, *Historia de la Domin.*, 4to., Mad., 1820, i, p. 211.) ABDALLAH BEN KLAIB BEN THABITA, and Giafar BEN MEUHASEEN, or MOUHAZIN; Muslimatou BEN ABD ALLAH BEN YOMAS; Abdallah BEN COLAIB or BEN KLAIB, and Abderrahman BEN HAMID; JALUBI; Abdallah BEN SAID BEN AYOUN, probably the same as Said BEN AYOUN; GIAFAR, perhaps the same as GEYER or HIEVER; Fath BEN IBRAHIM EL OMEYEH; Abubeker BEN ABU BARBUSTAR; MAHOMAD; YOUSSEUF ABUL HADJADI; HALI; ABEN MAHOMAD ABEN CENCIND; ABDERRAHMAN; Mahomad AGUDO; HAZAN; and SINAN.

ARCHITECTONIC. A word applied to any portion of the theory of architecture, and used by QUATREMÈRE, *Dict.*, s. v., and others in contradistinction to ARCHITECTURAL.

ARCHITECTOR. A late Latin word used instead of *architectus*. 80.

ARCHITECTURAL. This word differs from the word architectonic, inasmuch as, properly, it is applied by QUATREMÈRE and others to any portion of the practice of architecture.

ARCHITECTURE (It. *architettura*; Sp. *arquitectura*; Fr. *architecture*; Ger. *bauart*) has been treated by nearly all writers under three divisions; naval, military, and civil. Civil architecture, the subject of this Dictionary, comprehends the design,

construction, and decoration of all buildings, sacred, monumental, and domestic, in conformity with the requirements of convenience, strength, and beauty. It is therefore both a science and a fine art.

As a science, it requires proficiency on the part of its professor in mathematics, geometry, mechanics, optics, acoustics, hydraulics, the laws of heating and ventilation, chemistry, the nature of materials, the processes of all the trades which enter into the business of a builder, the state of the law with regard to the rights and divisions of property and to the restrictions and other matters connected with building, and the current value of property, labour, and materials: VITRUVIUS, i, 1, properly observes, that "if an architect be sufficiently master in all the arts connected with his profession to judge perfectly of the merit of their productions, it is the most that should be insisted upon, and if so qualified he shall not need to blush at his own insufficiency" in the mechanical operations.

As a fine art, it requires, in the treatment of materials, the exercise of an imagination fertile in regard to form, chiar'oscuro and colour, but still controlled by a judgment sedate enough to direct genius, and founded upon a knowledge of the critical and philosophical part of fine art in general (*ÆSTHETICS*), of the history of the art, and of the customs of various nations, which necessitates the knowledge of several languages. The *ELEMENTS OF DESIGN* (see *Detached Essay*), or "those things of which architecture consists", are described by VITRUVIUS, i, 2, in words to which most authors have been compelled to refer, more or less, for the groundwork of their own explanations or theories.

Architecture is to a certain extent imitative of certain prefigurations; the cavern, the tent, the cabin, and other types, have left indubitable traces in various national styles. As a science, it has been influenced, in every age and country, by the varying circumstances of material, climate, and mechanical skill; while as a fine art, it has been modified, in common with others, by the different accidents of civilization, social and political condition, religious feeling, and geographical position: but its constant object, however pursued, has always been to supply suitable habitations for mankind, appropriate edifices for public purposes, worthy temples for religious worship, and enduring monuments commemorative of national glory. In the words of Sir CHRISTOPHER WREN, "Architecture is founded on the experience of all ages, promoted by the vast treasures of all the great monarchs, and the skill of the greatest artists and geometers, every one emulating each other. And experiments in this kind being greatly expensive, and errors incorrigible, is the reason that architecture is now rather the study of antiquity than fancy."

Sound architecture masks and disguises nothing; it accepts willingly whatever conditions are imposed, and deals skilfully with obstacles and difficulties, as fortunate accidents and rare opportunities for the exercise of ingenuity and the attainment of happy effect. It treats the necessities of plan and construction as framework to be filled with appropriate ornamentation, or rather as rough materials to be moulded and fashioned to artistic beauty, and invested with the charms of imagination and poetic feeling, guided by strict propriety and correct taste. Although imposing dimensions and profusion of ornament may produce splendour, and the hardness of conception, shown in the skilfully balanced vault may create magnificence, yet, without excessive size of materials, or difficulty of construction, grandeur may be obtained in unison with pleasing simplicity, harmonious proportion, and elegant ornament; but these results depend upon the existence of a proper ratio of the several component parts, which is as essential in the works of architecture as in those of any other art.

The proper and judicious patronage of national architecture, includes the promotion of all the arts, and immortalises the names of monarchs and princes who would otherwise merit oblivion. The tyranny of Pericles is lost in our admiration of the Parthenon; and the name of Hadrian is rendered almost

respectable by his works of art. Public buildings are the most distinguished and durable monuments as records of the prosperity and glory of nations and races.

Questions on various subjects connected with Architecture, issued by the Royal Institute of British Architects, contain useful memoranda; while GWILT, *Encyclopædia of Architecture*, 8vo., London, 1842, and Supplement, 1851, will be found the best modern book fully treating upon architecture as a science and an art. The works upon its branches will be inserted at the foot of the articles on the various styles, as GRECIAN, ROMAN, etc., on the several branches of building, as CARPENTRY, etc., as well as under the heads of ÆSTHETICS; COURSE; DESIGN; DICTIONARY; HISTORY; JURISPRUDENCE; ORDER; PRINCIPLE; STYLE, etc.

ARCHITHOLUS. This term is translated by BRITTON, *Diet. of Archit.*, 4to., London, 1838, as the principal round chamber, the SUDATORIUM, of a Roman bath.

ARCHITRAVE (It. *architrave*; Sp. *arquitrave*; Fr. *architrave*; Ger. *architrav*, *unterbalken*.) A term derived from the Greek word ἀρχιός, chief, and the Latin word *trabs*, a beam. The beam, VITRUVIUS calls it EPISTYLIUM, generally placed upon the columns of the five recognized orders: where it is the lowest of the three principal divisions of the entablature, and although frequently divided into fasciæ, and sometimes found decorated, it is perhaps never seen ornamented with sculpture in the Doric of the Greeks, except in a case at Assos, illustrated by TEXIER, *Désér. de l'Asie Mineure*, fol., Paris, 1837, vol. ii. In antique edifices the architrave was generally a single stone; but an examination of the construction of many Roman buildings has shown that the architraves, as often made in modern times, were constructed with a number of stones which mutually sustained each other either by their wedge-like form, being in fact a FLAT ARCH, or by their being joggled into each other: the introduction of sculptured agrafes or keystones and other contrivances may have been due to the necessity of concealing the difficulties of such constructions, of which perhaps the most striking examples are the entablatures of the colonnade by Perrault to the Louvre, that in the Place Louis XV., and that of the portico of the church of S. Sulpice, at Paris, which are all upheld by metal cramps and cradling, as carefully shown by PATTE, *Mémoires*, 4to., Paris, 1769: and wherever a metal rosette is seen in the soffit of an architrave of that period it may be suspected of concealing the nut of a *tiran*, or metal bolt. A similar system, with various modifications, is illustrated by MONTFERRAND, *Eglise Cathédrale de S. Isaac*, fol., S. Petersburg, 1845. In England the general application of cast and wrought iron girders has rendered the execution of long architraves merely a matter of ashlar masonry.

The term architrave is also applied to the fasciæ and moldings upon the wall face of a door or window, and is then specified as a door architrave or window architrave, as the case may be; and where the best description of work is required, they are fixed upon the grounds. If in more than one face, they are glued up or rebated, and if wide should be keyed and buttoned. The upper fascia is called the header or heading architrave, and the lower the jack architrave. In timber buildings the architrave was sometimes called the reason piece or master beam, and in chimneys the mantel piece. 13. HYPERTHYRON.

ARCHITRAVE CORNICE (properly ARCHITRAVE AND CORNICE) is the name given to an entablature which has no FRIEZE. It was extensively employed about the eighteenth century in Germany and France, whence it appears to have been introduced into England; but the only antique example, except to doorways, generally cited, is that on the Caryatides of the Erechtheum at Athens, for that on the inside of the portico of the Pantheon at Rome can scarcely be considered a positive example, while the precedents quoted from the entablature of the upper order of the Coliseum, and from the imposts of the arch of Septimius Severus at Rome are hardly applicable. 13.

ARCH. PUB. SOC.

ARCHITRAVE (properly ARCHITRAVED) DOOR, called by VITRUVIUS, ANTEPAGMENTUM. The term for a door dressing which has an architrave on the top and sides, in contradistinction to one which has only jamb linings, or at most a plain fascia. The sides are called architrave jambs, and the head the *traverse*; i. e. the transverse architrave. In antique works the cornice frequently rests on the architrave without the intervention of a frieze; but flank pilasters under the consoles are scarcely to be met with in ancient works, although so much employed by the Italian masters; at Baalbec the jambs have plinths.

ARCHITRAVE (properly ARCHITRAVED) WINDOW. The term for a window dressing which has an architrave on the top and sides. The term was formerly applied to an ogee molding, with sometimes a listel or fillet, sometimes a roll, over it, commonly raised out of the solid timber, though in other cases the moldings were stuck (i. e. struck) and laid on; they are now occasionally, as formerly, made of molded or cut bricks for external work. ASCENDANT. CHAMBRANLE. 13.

ARCHIVUM, or ARCHIVUM, ARCEPS, ARCHARISSIMUM, ARCHARIUM, ARCHIBUS, ARCIUS or ARCIBUM, ARCIVUS or ARCIVUM (It. *archivio*; Sp. *archivo*; Fr. *archives*; Ger. *archiv*). The late Latin term for a place where records are kept. RECORD OFFICE. 80.

ARCHIVOLT, sometimes written by old authors ARCHIVOLT (Latin, *arcus volutus*; It. *modeno*; Fr. *archivolte*). The collection of fasciæ and moldings which form an ornamental band upon a wall round the opening of an arch, and terminate upon a SPRINGER, IMPOST, or PLATBAND. It is a word only applied by English writers in the styles belonging to Etruscan, Roman, and Byzantine art, and in the transition from Norman to Pointed architecture: according to the modern routine, the archivolt differs in each Order, the members being decorated in a manner analogous to the architrave of each order.

By French authors the word is applied not only to the space, often sculptured, between the hoodmold of the various orders of moldings which form the arch, but to a decorated face, sometimes occurring on the face included by those ARCH MOLDINGS, as well as generally to the arch moldings themselves. Few mediæval archivolts have an *agrafe* like those of Roman works; the examples, however, in the cloister of the cathedral at Puy-en-Velay, which are ornamented with a figure in alto relievo, are perhaps the sole exceptions known.

ARCHIVOLTUM. A late Latin word for a cesspool or common sewer, and an arched receptacle for filth. 80.

ARCHIOTUS or ARCHUS, see ARCUS.

ARCH STONE, see VOUSSOIR.

ARCHWAY. An arched aperture in a wall, when the ground or floor forms the bottom boundary of the void space.

ARCIBUM, ARCIUS, ARCIVUM, or ARCIVUS, see ARCHIVUM.

ARCOGRAPH. The name given by Mr. Rotch in 1821 to his invention of an addition to the arms of the CYCLOGRAPH or CENTROLINEAD of Peter Nicholson and others. The improvement consisted in the addition of a graduated quadrant, the divisions of which were intended to show on inspection the magnitude of the arc contained between the extremities of the chord line. An illustration and description will be found in vols. xxxix and xl of the *Transactions of the Society of Arts*, etc., 8vo., London.

ARCONIO (MARIO) of Rome, was a painter as well as an architect; a list of his works, which, with the exception of those at the churches of S. Isidoro and of the Madonna della Vittoria, are not very important, is given, p. 327, by BAGLIONE, *Vite*, 4to., Rome, 1649, who states that he died in the pontificate of Urban VIII (1623-1644), aged about sixty years; other writers say sixty-six, in 1640.

ARCOVOLUS and ARCOVOLITTUS. Two late Latin terms not yet satisfactorily explained, but rendered, the first a vault, and the second a niche. 80.

ARCS DOUBLEAUX. A French term for ARCH BAND, often employed by English writers after the time of De l'Orme.

WILLIS, *Nomenclature*, 4to., Cambridge, 1846. Sir WILLIAM CHAMBERS, following James Gibbs, uses the term for the soffit of arches.

ARCUTION. The employment of arches.

ARCUCCI (CAMILLO) was the architect, probably towards the end of the seventeenth century, of an arcade in the palazzo Pio, GWILT, *Notitia Ital.*, 8vo., London, 1818; and of the palazzo Dei Gottofredi in the piazza di S. Marco, also at Rome. FERRERIO, *Palazzi*, fol., Romæ, cc. 1700, pl. 94.

ARCUS. The contradictory explanations which have been given of the use of this word will be found in DUCANGE, *Gloss.*, s. v. It has been supposed that the *arcus ecclesiæ*, *choralis*, and *triumphalis*, meant the arch separating the nave from the choir of a church. ARCUS is supposed to be sometimes used for *apsis* or *PRESBYTERIUM*; yet *arcus presbyterii* is generally allowed to mean the arch over an apse marking the upper boundary of its recess. ARCUS *toralis*, explained by GWILT, *Diet.*, as the lattice separating a choir from a nave, is supposed by DUCANGE to be a mistake for *arcus choralis*; yet this author quotes the ACADEMY of MADRID for the use of the expression *arco toral*, for a principal arch; and he explains *torale*, s. v., as a curtain or hanging.

ARCUS was sometimes used to express the entrance to a basilica, or to an area before a basilica, according to S. PAULINUS, *Epist.*, 13 and 15; but BINGHAM, *Opera*, i, 291, affirms that it meant a porch or gateway to a church, so called from its arched construction.

ARCUS FERREUS. A term used by VITRUVIUS, v, 10, in his description of the mode of plastering on tiles laid on iron bearers. These bearers were either (*regulæ*) straight bars, or (*arcus ferreus*) curved bars.

ARDEMANS (DON TEODORO), of German origin, was born at Madrid in 1664, and practised painting as well as architecture. The first art he studied under Coclo, the second under the Jesuits. In 1689 he obtained in competition the position of *maestro mayor* to the cathedral church at Granada; and returning to Madrid in 1691, he was appointed assistant to the *maestro mayor* in that city, with the reversion of the post, which fell to him in 1700. His nomination as *maestro mayor*, on the death of Donoso, to the cathedral church of Toledo, is dated 21 March 1691; and as *maestro mayor*, on the death of Olmo, to the royal works, 30 May 1702. In the latter capacity he directed the execution of the greater part of the east front of the palace at Aranjuez; and designed the chapel and so much of a royal residence as was added in 1719 to La Granja de S. Ildefonso. He published at the same time *Declaracion y Extension sobre las Ordenanzas de Madrid que escribió Juan de Torija y de las que se practicaban en Toledo y Sevilla, con algunas Advertencias a las Alarifes*, Madrid, 1719. He gave in 1722 the designs for the church of S. Millan at Madrid. Narciso Tomé was appointed his successor as *maestro mayor* at Toledo, 27 October 1721, in consequence of the infirmities and absence of Ardemans, who died 15 February 1726, and for a long time suffered so much from illness as to be unable to make drawings without the assistance of his pupil Ortega. 66.

ARDERNE (JOHN) was clerk of the works, *clericus operationum regis*, at the building of the monument in Westminster abbey church to king Henry V, who died in 1422. RYMER, *Fœdera*, fol., London, 1740, iv, part iv, 81 b. On the 6th of February 1427, a sum of two hundred pounds was ordered to be paid under a writ of Privy Seal to the said Arderne for expenses of repairs at the Tower of London, and at the palace of Westminster. MSS. Cotton, *Cleopatra*, F, iv, fol. 31, in the British Museum.

ARDFERT (in Irish *Ardfeartbrendan*, *Ardbrenn*, or *Ardart*). Now a decayed village, but formerly the capital of the county of Kerry in Ireland, and an university town, as well as an episcopal see. This bishopric was united with that of Aghadoe, and in 1663 was joined with it to that of Limerick. The remains of the cathedral, dedicated to S. Brendan, are

about 78 feet long by 30 feet broad, and consist of a nave, chancel, and south transept, which last is now occupied as the parish church. The style of the chancel is the Early English Pointed; its east window is a triplet, the centre lancet being 30 feet in height. At each side of the window is a niche, with jamb shafts and arch moldings, in one of which stands the figure of a bishop in pontificals, supposed to be the effigy of Bishop Stack (1480-1488).

On the south side is an arcade of nine lancet windows of very beautiful design; and at the north side is an ambrey of two square compartments divided by a mullion. The south transept is of Perpendicular character. The west doorway is curiously placed near the north angle of the west gable of the nave; it is of Norman character. The town and religious edifices were plundered and burnt in 1089, the cathedral was probably restored immediately afterwards, which would account for the Norman style of some portions; it was, however, again destroyed in 1179, and was perhaps rebuilt at the beginning of the thirteenth century. The church was again demolished in the wars of 1641.

About thirty yards north-west of the cathedral are the remains of a small Norman chapel, which is considered a rather unique and remarkable building, originally consisting of a nave and chancel; the walls of the latter being entirely gone. The nave measures 36 feet in length and 21 feet in breadth in the clear of the walls, which are about 16 feet in height, and average 2 feet 10 inches in thickness; the quoins are curiously finished with projecting shafts elliptical on plan. The walling is of hammered rubble-limestone masonry; the quoin-shafts and dressings being of a fine-grained red sandstone found in the adjacent hills.

To the west of the above is a chantry-chapel of small dimensions, erected about the end of the fifteenth century.

The ruins of a Franciscan monastery, founded in 1253, and increased in 1389, stand at some distance, in the neighbouring Crosbie demesne. It consists of the chancel and portions of the nave of the abbey church; part of the cloisters; a massive tower at the west end of the church; and some remains of the refectory, kitchen, and dormitories; the prevailing style is Early English Pointed, portions being Transitional. The chancel is a pure specimen of the architecture of the thirteenth century in Ireland. There is a range of nine windows on the south side of the chancel, under which are several recessed tombs with canopies. The floor of the chancel is covered with sepulchral slabs, bearing floriated crosses, inscriptions, and effigies of ecclesiastics in low relief. The south transept, erected at the beginning of the fifteenth century, is connected with the nave by three lofty arches resting on cylindrical pillars, having molded capitals and bases. The design of the cloisters may be learned from the one side remaining perfect; it is plain but massive, and the masonry is executed with the greatest nicety and care; the material employed is a dark grey limestone, of exceedingly fine grain, very neatly squared, and fitted with great exactness. There are some curious features of construction in these ruins.

The Turaghan, or round tower, one of the finest of its species in Ireland, was 120 feet high; it stood nearly opposite to the west door of the cathedral until the year 1770 or 1771, when, from some cause, it fell. The material of which it was built was the dark grey limestone above mentioned. R. R. B.

ARDGLASS. A town which, in the time of Queen Elizabeth, was, next to Down and Newry, the principal place in the county of Down in Ireland. Its former importance is attested by several remains, among which are the buildings called King's Castle, Coud Castle, Jordan's Castle, Horn Tower, and the New Works. The Horn Tower is said to have been the dining-hall and kitchen belonging to the New Works, which appear to have been intended as a place of dwelling and deposit for the goods of merchants coming from beyond sea. Although partly destroyed, this last building consists of a range about

240 feet long, of two stories in height, containing several small apartments. There are petty necessities in each of the upper rooms, with a drain running down into the sea, which washes the back or east front. In this front there are only spike-holes, but in the west façade there are fifteen square windows, alternating with sixteen arched doors. The lower rooms were about 7 feet high, and the upper ones about 6 feet 6 inches; they were approached by a staircase in a centre tower, corresponding to the wing-towers of three rooms in each, 10 feet square, with stone-flagged floors supported without any timbers. The east front is embattled.

R. R. B.

ARDISIA CUBANA (*agracejo*). A hard wood of Cuba. **71.**
ARDMORE. The seat of an ancient bishopric in the county of Waterford, Ireland, is a picturesquely situated watering place on the bay of the same name. It is remarkable for containing many singular and interesting remains of antiquity; and as being the site of one of the earliest Christian churches in that country, founded by S. Declan, one of the four precursors of S. Patrick. He also founded there, A.D. 442, a religious establishment; in 449 it was erected into an episcopal see, united in the commencement of the thirteenth century to that of Lismore.

The ancient cathedral consists of a roofless nave and chancel. The nave is 72 feet in length and 26 feet in breadth, clear of walls; and the chancel 34 feet in length and 18½ feet in breadth; the greater part of the nave is of early Romanesque character; the principal entrance, a semicircular-headed doorway, was on the north side; the fine arched moldings and the carved caps only remain, with two semicircular-headed windows in the north and in the south walls, with large inward splays and molded jambs and arches, the labels of which run from one to the other, forming a string-course along the whole wall, under which, and resting on another string, is a series of panels, some with pointed and others with square heads. The floor of the church is paved with sepulchral slabs, many of an early date. The west gable is curiously ornamented with sculptures in alto-relievo; it contains two large semicircular panels, and seventeen semicircular-headed ones, containing a variety of grouped and single figures representing the Fall of Man, the Judgment of Solomon, the Twelve Apostles, and other subjects, now unintelligible from their mutilation. The stones at this end of the building are of unusually large size, hammer-dressed and fitted one to another, much in the manner of Cyclopean work. The chancel is of late date, and exhibits no feature of interest.

The round tower stands south of the church: it rises from a plinth 18 inches high, and 6 inches projection; and is built of a brown sandstone found in the locality, hammer-dressed in the neatest manner, the stones being accurately fitted: the roof is a conical covering, formed by the stones overlaying one another as they rise to the apex. The height of the tower to the stone eave-course is 91 feet; vertical rise of roof 9 feet; diameter of tower at base 15 feet 11½ inches, inter al diameter at level of door-sill 9 feet 1½ inches, thickness of wall at ditto 3 feet 5 inches, internal diameter at eaves 4 feet 8 inches, thickness of wall 2 feet 5 inches; the doorway (facing north-east) is semicircular-headed, devoid of architrave or ornament; the sill is 13 feet from the ground, width of opening at bottom 2 feet 2 inches, at top 1 foot 10 inches, height from sill to springing of arch 4 feet 9 inches, height to soffit 5 feet 8 inches. The tower is divided externally into five stories by four plain string-courses, a feature peculiar to this and Disert Tower, in the county of Clare; the windows are seven in number, as follows: No. 1 over the first string-course faces the N., is square-headed, height of opening 17½ inches, breadth at sill 12 inches, at top 10½ inches; No. 2 is above the second string, square-headed, and faces E.N.E., height 2 feet, breadth at sill 14½ inches, at top 12½ inches; No. 3 is a small round-headed aperture, facing S.S.W., 13 inches high 7½ inches wide, this rests on the third string-course, the others being nearly midway in the stories; the upper four windows are in

the fifth story, facing the cardinal points, they are on the same level and of similar dimensions as follows:—height 3 feet 10 inches, width at sill 17 inches, at springing 14 inches; three of these windows are circular-headed internally, but, externally, have triangular or straight-lined heads; the fourth is square-headed, and faces the south. Projecting from the internal wall, at various heights, but principally in the two lower stories, are sixteen stone corbels, most of them carved into grotesque and hideous heads of animals; this and Devenish tower being the only instances in which such grotesque corbel carvings appear.

South-east of the ancient church stands the Leabba, or bed of S. Declan, also called the Monachan, a small rectangular building, of great antiquity and curious construction; it stands due east and west, measuring only 13 feet 4 inches in length, and 8 feet 9 inches in width; it is built of hammer-dressed rubble masonry, of similar character to the larger church: the side walls project about 2½ feet beyond the gables at each end, forming a sort of vertical buttress, or anta; this feature is peculiar to this class of buildings, and to the diminutive churches erected previous to the ninth century in Ireland. Originally, the door was, as usual, in the west end, which is now built up; it was 5 feet 6 inches in height, width at sill 2 feet 5 inches, at lintel 2 feet, the sides inclining inwards as usual; the lintel is a massive stone of 6 feet in length: there is a small circular-headed opening in the east gable, and two diminutive windows in the north wall, square-headed, with inclined jambs; this building has lost its stone roof.

About half a mile from Ardmore, close to the sea-shore, is the ruined church of Disert Declan, the dimensions are about 66 feet by 18 feet, being a simple nave; the north wall is nearly levelled by the encroaching waves; the others are much dilapidated, and exhibit no feature of any interest. There are several other remains of antiquity in this neighbourhood, as Rath, Duns, etc. SMITH, *History of Waterford*, 8vo., Dublin, 1754; ARCHDALL, *Monasticon Hibernicum*, 4to., Dublin, 1796; RYLAND, *History, etc., of Waterford*, 8vo., London, 1824; CROKER, *Researches in the South of Ireland*, 4to., London, 1824; PETRIE, *Ecclesiastical Architecture of Ireland*, 8vo., Dublin, 1845; WILKINSON, *Practical Geology, etc., of Ireland*, 8vo., London, 1845.

R. R. B.

ARDRES (the ancient **ARDREA**). A town between Calais and S. Omer, in the department of the Pas de Calais in France. It is famous for its bridge, called the *Pont Sanspareil*, built in 1752, on which four roads meet, and which is a dome pierced by four vaults, semicircular in their sections and in the plans of their faces. BRIT. MUS. MSS. Reg., lxix, 32. *Addit.* 6769, p. 234.

ARDUINO DA BOLOGNA, see **BOLOGNA** (**ARDUINO DA**).

ARDUIN OF VENICE, see **TATA** (**ARDUINUS**).

ARE. The unit of the French superficial measure, being a surface of ten times the MÈTRE each way, or 1076.4298 English square feet. The names of the multiples on the decimal scale are the Décare, Hectare, Chiliare, and Myriare, and the parts are the Déciare, Centiare, and Milliarc: the Hectare is the quantity mostly used in speaking of the acreage of ground; it is equal to 2.471143 English acres, or 2 acres, 1 rood, 30.1 perches.

AREA. A term adopted from the Latin language, in which it was used with considerable latitude; thus it originally meant a large unencumbered space called in England a parade (It. *piazza*; Sp. *plaza*; Fr. *place*; Ger. *platz*), used for exercise, recreation, etc. It was often decorated with statues, and in some cases, fenced so as to prevent any encroachment; for this purpose it was also consecrated to some deity, whose altar was placed therein, and whose name was given to the area; VITRUVIUS, i, 7; HORAT. *Od.* i, 9. Hence, probably, the doubtful reading in MARTIAL, x, 24, may be correct, where area is used for the race-course, usually called *spatium*, in a circus.

It also meant any plot of ground for building, vacant in a city; VARRO, *De Leg.* v, 38; HORAT. *Ep.* i, 10: and the open

space formerly occupied by an edifice that had been demolished; Liv. iv, 16.

The use of the term for a threshing-floor is general among the classic Latin authors; but a different class of ideas arises from the following passage of GELLIIUS, iv, 5: "Area est ante deorum aedes quod in privatorum ædificiis vestibulum vocatur"; upon which comments have been made to the effect, that the name was given to the open space of ground generally surrounded by porticoes or colonnades, or else planted with trees and adorned with statues, in front of a temple, in imitation of the area or court-yard of the vestibule, in which the clients of a Roman patron waited till the time of his giving them audience. The open space on which the funeral pile was erected in front of a mausoleum was expressed by the same term; *area dei* was applied as the name of the *ambulacrum*, *paradisus*, or *parvis*, of the ancient basilican churches; and the word was used, in the lower ages, for a cemetery or enclosed burial-ground. At present, the term is used in this country for the space on which a building stands; for the superficial contents of any enclosed space; and for a sunk space before the windows of the lower stories of an edifice, being, in fact, a court on a small scale. It is in this latter sense that the word is generally found in plans of buildings, and in composition with many other terms. BACK-YARD.

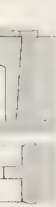
AREA DRAIN. (Fr. *Isolément aéré*). A narrow area, generally less than three feet in width, on the basement-floor of a building. The meaning of the term is precisely opposite to that of DRY AREA, and the confusion of the two is productive of much mischief. An area drain is properly not covered, and if, unlike a BLIND AREA, as ought to be the case, it be unbroken by cross walls, it is not liable, under proper provisions, to conduct dampness from the walls supporting the soil to those of the building. When the area drain is so narrow as not to allow of an opening up the greater portion of its cross walls—for such divisions become at times essential for strength and support—the opening should be left at the level of the pavement of the area drain; and, in all instances, the junction of the cross walls with the main ones should be worked in cement, or other precautions taken, to prevent the approach of dampness from the supported soil.

AREA WALL. (Fr. *contre-mur*). The wall which forms the sides of an area. When such a wall backs up ground which is liable to the vibration of constant, even if not heavy, traffic, it will be found that no reasonable thickness of wall, nor a moderate amount of battering, which is rarely given, will prevent the upper portion at least of the wall from being thrust over by the ground. To obviate the necessity of frequent repairs, it is therefore usual, and always desirable, whether there be a grating over the area or not, to place stone, brick, or iron counterforts a little below the level of the public way, so as to support the face of the wall; if there are cellars under the public way, the necessity for such struts to the face of the spandril-walls between the arches of the cellars, becomes evident in the course of a very few years after the formation of the area.

ARECA CATECHU. The most beautiful palm in India, having a remarkably straight trunk, about twenty inches in circumference, which does not taper, and is often from forty to fifty feet in height.

In the Brazils the timber is called nutmeg wood. In Malabar, when the tree is old it is called *arece*, but when young *parayuga*.

A. oleracea, the cabbage palm, is in great abundance in the mountainous parts of Jamaica and other West India islands; growing to the height of from one to two hundred feet, with a trunk not more than six or seven inches in diameter. The tree is used for cabinet work, turnery, etc., and its trunk, when felled and exposed to the air, quickly rots in the centre and becomes a naturally hollow cylinder, which, on account of the hardness of its outside, forms a very durable waterpipe, often as much as a hundred feet long, and is said to become, when buried, almost as hard as iron. SLOANE, *Jamaica*, etc., 4to., vol. ii, p. 116.



14. 71.

ARELATE. The ancient name of ARLES in France.

ARENA. This term, with the addition of FLUVIATICA, FOSSITIA, and MARINA, is used by VITRUVIUS, ii, 4 and 6, for river, pit, and sea-sand respectively.

ARENA. The area enclosed by the PODIUM, or inmost wall of an amphitheatre, was so called because it was covered with sand; SUTTON. *Nero*, 53. JUV. *Sat.* iv, 100. The form of the arena, though sometimes circular, was generally oval: the best authorities differ as to the use of the remains of brick and stone work which have been found in it; some simply asserting that they were placed as sleeper walls to support a wooden or other floor; while others state that theatrical machinery of different kinds was inserted between these walls, or was dependant upon them for steadiness and support; and some authors consider them intended as channels for water conduits.

The term arena has also been applied to the *koulorpa*, or that portion of the orchestra of a classic theatre which was forbidden to the members of the chorus, who otherwise would have been sometimes hidden from the audience by the podium.

The common mode of expression that combats took place *in*, should properly be *on*, the arena; but the word was sometimes applied to the amphitheatre itself. In many cities a *place*, so called, indicates the former existence of an amphitheatre; and, at the present time, the modern amphitheatre at Milan, designed by Canonica, is also called by the citizens, *l'Arena*. AMPHITHEATRE. ARENARIUM. EURIPUS.

DUCANGE, *Gloss.* s. v., quotes a passage in which this word is applied to the body of a church; and it is explained in old dictionaries as "the middle or body of a temple, comprehending the whole space between the ante and the extreme wall of the building."

W. H.

ARENARIUM, or ARENARIA. A Latin term used by VITRUVIUS, ii, 4, for a sandpit; and by later writers for an amphitheatre; a grave, or sepulchre; a cemetery; and a crypt. 51. 79. 80.

ARENAS (ANDRÉS DE) constructed the church of S. Maria at Olivenza, in the province of Estramadura in Portugal, according to an inscription on the front, which simply states, "Andrés de Arenas año di 1584." He is considered to have been a Portuguese architect, and some relation of Francisco de Arenas, who was engaged upon the *puerta de los leones* in the cathedral at Toledo. 66.

ARENATIO or ARENATUM OPUS. The term used by VITRUVIUS, vii, 3, for a stucco composed of lime and sand, *i.e.* mortar.

AREOSISTYLE, properly AREOSYSTYLE.

AREOSTYLE, properly AREOSTYLE.

AREQUIPA. The capital of the department of the same name in Peru. The city is esteemed one of the best built and most beautiful towns in South America; the houses, having vaulted roofs on thick walls, generally one story high, are an exception to the usual mode of building in countries where earthquakes are frequent. The cathedral, built when the town became the seat of a bishopric in 1606, is dedicated in honour of the Assumption. The other large buildings are three parish churches, as many convents, six monasteries, the college of the Jesuits, and an hospital. The city is also adorned by a handsome bronze fountain in the great *plaza*, or public square, and by a stone bridge over the river Chile, which runs through the city, and, by means of canals, passes through the leading streets.

ARERDE. The old English form of reared, as meaning erected or built.

ARETINO (NICOLÒ DI PIETRO), or N. D'AREZZO, see LAMBERTI and SELLI.

AREZTIBURU (DOMINGO DE) was commissioned, in 1580, to decorate the chapel of S. Jago in the church of Sta. Maria at Segura, in the province of Guipuzcoa in Spain. 66.

AREZZO (the ancient ARETIUM or ARRETIUM). The capital of the province of the same name in Tuscany, and the seat of a bishopric. The walls, which are three miles in length, with four gates, inclose wide and well-paved streets laid out with

much regularity, and, for the most part, containing well-built edifices. The fortress was built by Sangallo. The episcopal buildings and the cathedral, dedicated to the Virgin and S. Donatus, were continued by Margaritone d'Arezzo (not Marchione d'Arezzo) on the design of Jacopo or Lapo, in 1275 or 1277; the altar and Ubertini Chapel were added in 1286 and 1290: the ceilings, in their present condition, date from 1341: the stained-glass windows (1500-1520) are considered to be of the highest importance as objects of art and history; some were executed by Guillaume Marcillat. The church also contains a remarkable altar-screen by Giovanni da Pisa, 1286; the tomb of Pope Gregory X, by Margaritone, 1276-1280, and the fine monument to Guido Tarlati di Pietramala, said to have been designed by Giotto, but which, at all events, was executed by Agostino and Angelo da Siena (1320-1330), upon his recommendation. The loggia which joins the episcopal palace to the church was designed by Bartolomeo della Gatta, 1473-1497.

The church of S. Maria della Pieve (*de Plebe*) which is supposed to occupy the site of a temple to Bacchus, dates its commencement from about 972: Marchione added, in 1216, a portal, on which his name appears: but Vasari, who erected a chancel to hold the choir, at his own expense, and so isolated the high altar, makes the mistake of attributing to him the execution of the rest of the façade (with three open arcades of various kinds of pillars), which was in progress at the commencement of the fourteenth century, and the campanile, of five stories in height, which received its bells in 1330.

In this city are two collegiate and fifteen parish churches, and several religious establishments, including twenty-two monastic houses. The church of the abbey of Sta. Flora, rebuilt by Vasari, is visited on account of the architectural painting of a cupola on a flat ceiling, by the celebrated Andrea Pozzo. The church of S. Domenico is said to have been built by Maglione, a pupil of Nicolo da Pisa, who, being himself applied to, recommended Maglione. The church of the Madonna della Grazie, built by Benedetto da Majano towards the end of the fifteenth century, consists of a nave and choir, with sacristies, and presents many features of interest, especially the arcaded portico, the external cornices, and the fine stained glass: the plan also is remarkable. The church della Nunziata, now called la Madonna della Lacrime, chiefly designed by Bartolomeo della Gatta, was completed after his death by Andrea Contucci and by Antonio di Sangallo also the builder of the vestibule, which is separated from the church by a grand arch with four columns of the Doric order. The church of S. John the Baptist, belonging to the twelfth century, is given by FRATELLI TERRINI, *Viaggio pitt. della Toscana*, iii, pl. 55-57.

The *palazzo pubblico*, built in 1278 (*Annali Aretini*), not 1332, has been modernized; the public museum and library is contained in a building of the fourteenth century, formerly belonging to a *fraternità* which in 1573 caused the loggie in the piazza Maggiore to be built by Vasari; they are considered to be his masterpiece in architecture; the façade is nearly 400 feet in length, and includes the *dogana*, or custom-house, and the theatre. A local guide attributes the commencement of these buildings in 1552 to Felix Fossato. The city also contains the episcopal residence; several handsome palazzi, especially that belonging to the Albergotti family; an university; an academy of arts; medical and other schools, and four hospitals, of which one is given by FAMIN and GRANDJEAN, *Architecture Toscane*, fol., Paris, 1836, on account of its well-studied plan. Other buildings in this city are likewise given in that work.

The only antique ruins visible in the city are small portions of *opus reticulatum*, called the remains of an amphitheatre, and some fragments of Roman brickwork, which serve to connect it with the *Roman Arretium*. VITRUVIUS ii, 8, and PLINY xxxv, observe, that the walls of Arretium were of brick; this appears to be the only case of the use of that material for such a purpose by the Etruscans, if those authors referred to an Etruscan city; some apparently Etruscan walling with buttresses, found at

ARCH. PUB. SOC.

Poggio di S. Cornelio, two miles from Arezzo, is considered to mark the site of the first Arretium; otherwise it must be the Arretium Fidens, and the Etruscan Arretium Vetus has yet to be discovered. DENNIS, *Cities, etc., of Etruria*, 8vo., London, 1848; RONDINELLI, *Relazione della Città*, 8vo., Arezzo, 1755; ALESSI, *Cronica d'A.* MS. of 15th cent., in Bib. Ricciardini at Florence; H. GALLY KNIGHT, *Eccelesiastical Architecture of Italy*, fol. London, 1844, vols. i and ii; BRIZI, *Guida d'Arezzo*; VASARI, *Vite*, 12mo., Florence, 1845; *Annali Aretini* in MURATORI, *Script. Rer. Ital.* xxiv.

AREZZO (AGNOLO D') has the credit of designing the choir as executed in the cathedral church of Sta. Maria del Fiore at Florence, according to a statement of the deliberations, 26 Nov., 1435 or 1437, upon his alterations of the design left by Brunellesco, given in *La Metropolitana Fiorentina illustrata*, 4to., Florence, 1820.

AREZZO (MARCHIONE D' or MARCHIONNE D'). VASARI, s. v. *Arnolfo di Lapo*, states that Pope Innocent III, 1197-1216, selected Marchione to erect many buildings in Rome; among them is named the Torre dei Conti, to which family the pope belonged; the ancient edifice of the hospital and church of S. Spirito in Sassia, in the Borgo Vecchio, afterwards much altered; and the chapel of the Nativity, afterwards rebuilt by Pope Sixtus V, in the church of Sta. Maria Maggiore: the church of S. Silvestro is also said to have been under his charge. He completed, with great credit, the side doorway of the church of S. Pietro at Bologna, now destroyed, but of which the scattered remains are yet to be seen. RUMOHR, *Italienische Forschungen*, 8vo., Berlin, 1827, ii, 155. VASARI, by mistake, attributes to him the façade of Sta. Maria della Pieve at Arezzo, on account of the following inscription on the portal: Anno D.M.CC.XVI. MS. Madii. Marchio. Sculpit. Pbr. Maths. Munera. Fulsit. I. Tpe. Archipbi. Z. RONDINELLI, *Relazione della Città d'A.*, 8vo., Arezzo, 1755.

AREZZO (MARGARITONE D'), supposed to have lived between the years 1215-1290 according to some authors, but between 1236 and 1313 according to the first edition of VASARI, was the son of an Aretine, named Magnano, and was chiefly a painter and sculptor. Among his architectural works were the portal (not the front) of the cathedral church of S. Ciriaco, and, in 1270, the design, construction, and some of the decorations of the Palazzo del Governo at Ancona. He died at the age of seventy-seven years, and was buried in the Duomo Vecchio, outside Arezzo, for which city he had superintended, from 1275, the execution of the design of the cathedral, episcopal palace and other buildings, begun by Jacopo or Lapo, and had executed, 1276-1280, the tomb of Pope Gregory X; Ricci, *Memorie Storiche, etc., della Marca d'Ancona*, 8vo., Macerata, 1834; LANZI, *Diet.*

AREZZO (NICOLÒ D'), or N. DI PIETRO ARETINO, see LAMBERTI and SELLI.

AREFAST or HERFAST, see THETFORD (ARFAST OF).

ARGÆLÆ UXAMA, the ancient name of OSMIA in France.

ARGELIUS is mentioned by VITRUVIUS, preface to book vii, as having written a work upon the Ionic temple of Æsculapius at Tralles, of which he was the architect; and another, "*De Symmetriis Corinthiis*." It is agreed that he must have lived before the era of Pericles.

ARGENTARIA TABERNA. The term used by VITRUVIUS, v, 1, for the shop of a private banker, which was generally placed near the portico which surrounded the forum.

ARGENTORATUM. The ancient name for STRASBURG in France.

ARGIL. This word was properly the old term for the earth named by Morbeau alumina, i. e., for the oxide of ALUMINUM in combination with water, which is dispersed over the globe in the shape of clay, loam, etc. It is now more usually applied to the finest kinds of clay, such as those which nearest approach the condition of pure alumina; and in common parlance, the word denotes any potter's or brick earth, viz.,

alumina with some silica mixed with oxides of other metals, and various impurities. The purest argil is used to give a clear effect to white grounds in pottery; many clays are rendered more plastic by the addition of proper quantities of this condition of alumina. It is firmly coherent, weighty, and compact, stiff, viscid, and ductile to a great degree while moist; opaque; without lustre; smooth to the touch and unctuous, not easily breaking between the fingers, nor readily soluble in water, and when mixed in it, not readily subsiding from it. It imbibes water and oil to saturation, and is softened by the retention of them; does not effervesce with nitric acid, and hardens by fire into a sort of stony substance, retaining any impress given by a mould. It is not known that any kind of earth shrinks so much as clay; and hence the purity of argil may be judged from the degree of its contraction. The varieties of argil are important, as entering into the composition of artificial stones, of bricks, and tiles, and in the pottery called stone-ware, which is now made available for sewage purposes. GLAIRE and WALSH, *Encyc. Cath.*, s. v. *argile*. W. H.

ARGILLACEOUS, or ARGILLOUS, EARTH and ARGILLACEOUS, or ARGILLOUS, SAND, are terms used to express the presence of alumina in loam and sand. W. H.

ARGOS (or more emphatically, "the Achæan Argos"). The chief city of the ancient territory of Argolis in the Grecian Peloponnesus. BLOUET, *Expédition Scient. de Morée*, fol., Paris, 1833, vol. ii, gives a sketched plan of the city, pl. 57; a plan, section, and perspective view, pl. 55, of a curious pyramid on the road from Argos to Tegea; and illustrates, in pl. 58, 59, the remains of a large theatre, consisting of seventy-two well-preserved seats excavated in the rock, divided, by three *ballets*, into thirty-six lower rows, sixteen for the next division, and twenty above; all being arcs of concentric circles. A little south of these are stone seats, which have belonged to a smaller theatre; and in the neighbourhood is a niche that, in all probability, formed the termination of an aqueduct, of which a large portion is traced at no great distance. Besides these, there are remains of Roman constructions, cisterns, and cyclopean and polygonal walling in several parts, as well as to the citadel, where the ruins resemble those of Tiryns and Mycenæ. HERAËUM. LEAKE, *Travels in the Morea*, 8vo., Lond., 1830, ii, 394; MURE, *Journal*, 8vo., Edinburgh, 1842, ii, 178. W. H.

ARIANO (the Latin ARIANUM). A city in the province of Principato Ultra, in the kingdom of Naples. It contains a handsome cathedral dedicated to the Assumption, two collegiate and twelve parish churches, six convents, an hospital, and a *collegio*. It was nearly destroyed by an earthquake in 1456, and again suffered in 1732.

ARIAS (LOPEZ) of Zamora, was directed, in 1372, by King Henry II, of Castile, to construct the Alcazar at Ciudad-Rodrigo: the inscription over its gateway testifies to the works being commenced in that reign; but, unless the copyists are mistaken, it adds that the work was begun in 1410. 66.

ARICIA, the ancient name of LA RICCIA, in the Papal States.

ARIENSE (ALESSIO), of Bergamo, in FRANCHETTI, *Storia*, 4to, Milan, 1821, but of Bologna, according to TICCOZZI, was requested, June 27, 1490, to report upon the works of the cupola of the duomo in Milan; but as he was occupied with the deepening of the river Brenta, the work at the duomo was suspended until he could survey the edifice. According to MARCHESI, *Lives*, etc., 8vo., Dublin, 1852, ii, 156, an architect named Alessio Aleardi, was employed on the same canal down to about 1507; but there is great probability that these were the same person, and, from page 162, that his proper name was Scarpagnino.

ARIGHINI (GIUSEPPE), born at Brescia towards the end of the sixteenth century, according to TICCOZZI, was painter and architect to the court of Brunswick Lüneburg, and is mentioned as having inspected, for his patron, the construction and design of the theatres in France, Germany, and Italy, previous

to his own design of the Court theatre. COZZANDO, *Vago e Curioso Ristretto*, 8vo., Brescia, 1694, p. 130.

ARIGNA. A village situate on the left bank of the river Arignan, a tributary to the lake Allen, about five miles from the town of Carrick-on-Shannon, in the county of Roscommon, and near the borders of the county of Leitrim, in Ireland. It is famous for a very superior description of iron, equal to the Swedish and Prussian, and fitted for fine castings and for bar or wrought-iron work.

The table of the analyses of the ores from the different mines of the United Kingdom, shows their various qualities.

AVERAGE RESULTS.

	Sir Robt. Kane		L...		Hughes	
	Roasted.	Native.	Roasted	Native.	Roasted	Native.
Arigna ore.....	58.2	40.0	61.6	43.5	62.3	43.0
Staffordshire	40.4	28.0	41.5	28.6	41.0	28.3
Ordinary Welsh	44.7	31.4	44.6	32.0	45.0	31.5
" Glasgow	45.8	31.6	45.0	31.5	46.0	32.4
Kilkenny	55.3	38.6	56.0	38.5	56.5	38.3
Musket's Blackband*	63.1	41.0	63.6	40.9	63.6	42.0

* Blackband is fitted only for use as cast metal, as it loses its malleability in the furnace. COAL. IRON. W. H.

ARIGUCCI (LUIGI), a Florentine, designed the façade of the church of Sta. Anastasia, at Rome. 3.

ARIMINUM, the ancient name for RIMINI, in the Papal States.

ARIPENNIS. A Roman word used for half the JUGERUM, but which during the middle ages was applied to a different measure, and corrupted into the French word ARPENT. 80.

ARISTOTILE (GIOVANNI FRANCESCO), was also a sculptor, and commenced, from the designs of Raffaello, the Palazzo Pandolfini, at Florence. He died in 1530. This building was completed by his brother Bastiano, who was born in 1481, and died in 1551: FAMIN and GRANDJEAN, *Arch. Toscane*, fol., Paris, 1837.

ARISTOTILE (ALBERTI), see ALBERTI (ARISTOTILE), or FIORAVANTI (RIDOLFO), and SANGALLO (BASTIANO or SEBASTIANO DA).

ARK. A chest used in farm houses for keeping meal or flour, which is still to be seen in many counties as far south as Lancashire: they are usually found (when of great age) to be formed of oaken planks, sometimes elaborately carved. In Scotland the ark is a diminutive of the girmel. The strong box of a Jewish family is also called *archa* in a warrant dated 45 Henry III, given in RYMER, *Fœdera*: and the Welsh use *arkh* as equivalent to coffin; HUNTER, *Hallamshire Glossary*, 8vo., London, 1829. ULPHILAS, *S. John*, xii, 6, uses *arka* for a chest or coffer containing money. In the vestry of the church of S. Mary de Castro at Leicester there existed, until 1795, a kind of press or ambry called an ark, made in order to hold eight cranes on which the vestments of the priests were hung. NICHOLS, *Hist.*, etc., of Leicester, fol., Lond., 1815, i, 303.

ARKHOURI or ARGHOURI. A village on the northern side of Mount Ararat in Armenia. It contains about two hundred houses, a fortress, and a remarkable church, built, according



to DUBOIS DE MONTPEREUX, *Voyage autour de Caucase*, fol., Paris, 1839, of black lava, and lighted from a dome 15 French feet in diameter. The front of the choir is decorated with two triangular niches. A date of the eighth century is attributed to this church, in consequence of the side doorways being blocked up with earth as high as the springing of their arches, at which level is a tombstone dated 955, the year in which the princess Olga was baptized at Constantinople. This church and the neighbouring monastery and chapel of S. James are in perfect preservation. ARMENIAN ARCHITECTURE.

ARLER or ARLER, (HEINRICH), see ZAMODIA.

ARLERI or ARLIERI, (PIETRO), of Bologna, or PIETER

AHRLER, *de Polonia*, as he is sometimes called, is stated by HAGEN, *Briefe in die Heimat*, 12mo., Breslau, 1818, i, 9, and 262, to have been reputed at Prague to be the son of Heinrich AHRLE, of Gemunde, in Swabia; but it seems remarkable that the father must have been between seventy-five and eighty-five years of age when actively engaged at Milan, if not also at Pisa. ZAMODIA.

Pietro Arleri, when only twenty-five, or, as some authors say, twenty-three, years of age, designed and commenced at Prague, the celebrated Moldau-bruecke, the first stone of which was laid 9th of July 1357 or 1358 (finished in 1507); and the church of All Saints. He is recorded as the designer in 1360 of the choir of the church of S. Bartholomew at Colin, on the river Elbe, and as succeeding Matthieu d'Arras, in 1356, as architect to the cathedral in the same city until 1385, when he finished the edifice, so far as it has been completed. His bust, on one of the keystones of the vaulting, and his portrait, are preserved in the cathedral. BALBIUS, *Miscell.*, x. 1, p. 129; PUBITSCHKA, *Chronolog. Geschichte Bochem.*, v. 1, 474; SCHALLER, *Beschreibung der Stadt Prag.*, i, 186, ii, 340; OTTE, *Archæologie*, 8vo., Leipzig, 1854. 20. 26. 68.

ARLES (the Roman ARELATE, ARELATUM, or CONSTANTINA). A city in the department of the Bouches du Rhone, in France, formerly an archbishopric, of which the see is now united to that of Aix. The town is a remarkable example of the old style of building houses, with cantilevered stories and eaves, in intricate, winding, and narrow streets, except in the newer portions, where the streets are regular and tolerably wide, but all are paved with round flints. It has but three *places* of any importance; the principal one and market place, the *grande place*, or *place royale*, was used at no very distant period as a circus for bull-fights, and is surrounded by the hôtel de ville, the museum, occupying the former church of S. Anne, the archiepiscopal palace, originally built in 1388, the monastery of S. Trophimus, and the cathedral. This last, dedicated to SS. Stephen and Trophimus, is in many portions, especially the exterior, in the style *Byzantin*, but the edifice chiefly dates from the fifteenth century; the interior has been modernized, the choir, its aisles, and chapels having been added by Cardinal Alleman (1423-1429). The edifice is altogether about 240 feet long, 90 feet wide, and 60 feet high; the bell-tower being 137 feet high. The portal, which is dated by tradition, 1221-1233, with apparent justice, is a deeply recessed semicircular arch, resting on the horizontal lintel of the doorway, which is supported in the middle by a violet granite pillar from Elba: the tympanum, or head of the arch, is occupied by a sculptured Doom, and is protected by a projecting porch with square, octagonal, and circular pillars, resting upon animals, some of which appear devouring human figures. It is illustrated by LABORDE, *Monumens, etc.*, fol., Paris, 1816, pl. 124, as well as the cloisters, pl. 123, constructed under Hugues Béroard on the south side of the cathedral. Their east side, certainly dating from 1221, has semicircular arches, as well as the north side, to which the French archæologists give an earlier date. The pointed arches on the western side were executed under archbishop François de Conzié in 1389, as well as those on the south side, which is richly decorated with canopied niches: the impostes are supported by coupled columns, said to have belonged to the podium of the ancient theatre, which are placed athwart the wall, with carved groups for capitals: the rich piers, decorated with figures the size of life, at the angles of these cloisters, and the square bell-tower, are alike interesting.

The church of Notre Dame, said to occupy the site of a temple to Cybele, was built in 1046, and repaired in 1157: illustrations are given by TAYLOR and NODIER (*Languedoc*), pl. 171, c, d, e. The church of S. Julien, which has a Gothic interior and an Italian façade, was rebuilt in 1647. The church called the Tombeau de S. Césaire probably dates from the eighth century; it is the most ancient in Arles, and now serves as a warehouse.

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The *Hôtel de Ville*, executed by the architect Peyret, from the designs of Jules Hardoiné Mansard, bears the date of 1673; the public library, and a collection of objects in natural history, are now deposited therein: it has a front in each of two *places*, and is an edifice of three stories, and as many orders, in height, surmounted by a turret. A stone vaulted ceiling of the immense vestibule on the ground floor is highly praised. There are few other modern works of importance, except the adjacent *beffroi*, which was commenced in 1547, and finished in 1553.

The ancient remains, beside the ruins of an aqueduct, formerly many miles in length, offer the following subjects. In the *Place du Forum*, which has received that name from tradition or invention, there have been discovered foundation-walls, which, with ancient masonry above ground, have been called *thermæ*: according to SEUVIN, there were two other similar establishments in the vicinity, connected by long galleries. Close to these foundations are the remains of the theatre destroyed by CYRILLUS in 446, consisting of an architrave on two Corinthian columns, the one being of African breccia, the other of white marble, which are supposed to have formed part of the scene. The external diameter of the theatre, as traced by its archways in the ruined walls and the pedestals of other pillars, was 342 feet. The auditorium still contains some of the stone seats. There are two parallel walls, about 9 feet high, extending the width of the orchestra, one foot apart, with projecting piers, at regular intervals, which have excited considerable discussion as to their use, but are now generally supposed to have supported a pulpitum, or stage, or else the machinery of the curtain. An archway, called the *Arcade de la Misericorde*, in one of the neighbouring streets, and another, called the *Tour de Rolland*, with pseudo-Doric pilasters supporting a triglyphed and bucraned architrave, a frieze with scrolls, and a modillioned cornice, fix the two extremities of the *cavea*: LABORDE, pl. 78, 79, 80. The *Chateau*, or *Tour de la Trouille*, *aula troliæ*, is a piece of brick-work, called part of the palace of Constantine, standing in a narrow street near the river, and is given in the same work, pl. 81. In the *Place des Hommes*, or *de S. Julien*, are two composite columns of granite, with part of their entablature and of a pediment, which have been called the remains of a temple to Minerva; also the capitol or palace of the municipal legislature under the Roman dominion, and by others they are considered to fix the site of the forum; but ESTRANGIN considers that the columns have been removed from their original position.

A circus, formerly on the south side of the town, next the Rhone, was destroyed by the inundations of the river about the end of the fifth century. An obelisk of grey granite (formerly called Egyptian, but lately said to have come from the quarries of Estrelle, or Esterel, near Fréjus, was discovered in the ground in 1389), formerly belonging to this circus, is now in the *place royale*; it was broken in two pieces, separated considerably from each other, and has neither inscription nor hieroglyphics, but a modern metal termination; the height is about 47 French feet, tapering more rapidly than any similar Egyptian monument. Its base measures 7 feet 4 inches on each face, the top is about 20 inches square; it was erected in 1675-6 (for the first time, according to the French authors) on four lions resting on the top of a pedestal about 20 feet high, in a stone and iron-railed enclosure.

The amphitheatre, which has been ascribed to the age of Titus, has had dwellings built upon and against it, but the line of its circumference is complete; it appears to have consisted of some subterranean arches, two stories of sixty arches in each, and an attic, rude in style, but beautifully constructed of very large and well-fitted stones, without cement; the openings are sometimes covered by flat arches of small stones, and sometimes by huge straight lintels: the orders employed were the Doric and Corinthian, of which last only one capital is preserved. The outer wall, about thirteen feet thick, is nearly separated from the inner one, for under the Arab domination the vaults were

removed, and the whole space of its site filled up with rubbish, as a means of defence, to the level of the second tier; this contributed to the preservation of the *PODIUM*, which, upon excavation about the year 1830, was found nearly perfect and faced with marble: the *visorium* is computed to have accommodated from twenty to twenty-five thousand spectators, on forty-three rows of seats, with five corridors; there are many conflicting statements as to its size, that of *ESTRANGIN* differs slightly from that given *s. v.* AMPHITHEATRE, in fixing the exterior major axis at 450 feet 2 inches, the exterior minor axis at 350 feet 6 inches; the interior major axis at 227 feet 8 inches, and the interior minor axis at 130 feet; and the similarity of these modern mensurations disposes of the sizes given by *BLONDEL* and others, who could not have worked satisfactorily amongst the dwellings which then occupied the arena. The two square towers, 90 feet high, remaining out of four which surmounted the edifices, are allowed to be memorials of about the year 739, when the Arabs were expelled from this city by Charles Martel. This is one of the few theatres having vaulted substructions for foundations.

The cemetery, situated on a hill outside the city, is entered by a Romanesque archway attached to a small chapel; it is divided into two portions, respectively called the *Aliscamps* or *Eliscamps*, *Elysii Campi*, and the *Moleyrés* or *Moulaire*; both were formerly filled with Pagan and Christian works of Roman art; the former portion is now nearly cleared, and the latter has also served to supply the museums of Arles, Marseilles, Toulon, and other places: the cemetery contains several chapels falling into decay, of which the most interesting is that dedicated to S. Honorat and Notre Dame de Grace, which has an octagonal tower of two stories in height, having two semicircular-headed windows in each face; the interior, however, apparently belongs to the fourteenth century.

About two miles from Arles are the ruins of the once celebrated abbey of Montmajour, which was founded in the tenth century; they exhibit almost every style in fashion from that time to the eighteenth century, the occupants having then been removed by Louis XIV, lest their buildings should surpass his own works at Versailles. The arrangement of piercing the semicircular wall of the crypt of the apse with windows, so that the high altar placed between the priest and the congregation may be seen from the side chapels built against the exterior of the crypt (as shown in the illustration, furnished by Mr. James Bell, M.P.), is worthy of notice; the staircases are also admired. The semicircular vault, on straight and curved plans, found in this crypt, may be compared with the similar helical vaulting belonging to the celebrated *VICE* or staircase in the neighbourhood, called the *Vis de S. Gilles*. At the foot of the hill is a chapel in the style *Byzantin*, in 1019, to the Holy Cross: its plan is very remarkable, as it consists of a square tower, with an apse to every side, and a porch attached to the western one.



Du MEGE, *Essai Hist. sur la Cathédrale d'Arles* in *ENGELMAN'S Collection*; CHAPUIS, *Cathédrales Françaises*, fol., Paris, 1829; *Moyen Age Monumental*, pl. 60, 92, 115; *Moyen Age Pittoresque*, pl. 59; *ESTRANGIN*, *Etudes Arch.*, etc., sur *A.*, 8vo., Aix, 1838, and *Description de l'Eglise d'Arles*; SOMMERARD, *Album*, fol., Paris, 1848, vi, 2; *SEGUIN*, *Antiquités d'Arles*, 4to., Arles, 1687; *CARISTIE*, *Notice sur l'état actuel de l'Arc d'Orange*, etc., 4to., Paris, 1839; *FROSSARD*, *Tublauc*, etc., de Nîmes, etc., 8vo., Paris, 1816. W. H.

ARMAGH (in Irish *Ard-Macha*). A city in the county of the same name in Ireland: it is the seat of the primacy of that country, owing its ecclesiastical preeminence to S. Patrick, who founded in this city a monastery of Augustine monks, and a school or college, which subsequently became one of the most celebrated seminaries in Christendom. The city is of an oval

shape, beautifully situated on the side of a hill; the streets, generally radiating from the cathedral, are handsome, the houses are chiefly well built, and supplied with pure water.

In the centre of the town stands the cathedral, consisting of a nave with aisles, a chancel, transepts, and central tower. It measures 183 feet 6 inches in the clear from east to west, and 119 feet in the clear along the transepts. Portions of the various styles in use, from the Hiberno-Romanesque to that of the sixteenth century, are found. The original building was erected by S. Patrick, about the year 445; the description given in the tripartite life of this saint records the church to have a nave and chancel 140 feet long. This structure was injured by lightning in the years 995 and 1020, as well as by the Northmen during their various incursions; wherefore considerable repairs were made in 1125, and Gelasius, who succeeded to the primacy in 1137, is said to have rebuilt it in 1145 (mention is made by the annalists of a lime kiln sixty feet square being constructed for the purposes of the new building); but in 1263 or 1264 it was again under repair. The cathedral was nearly destroyed by Shane O'Neil in 1567, at which time the roof was burnt and the tower destroyed. Archbishop Hampton in 1613 repaired the cathedral, "rebuilt the steeple, beautified the south and north walls with fair windows, roofed the aisles, and made platforms on both sides of the church." The edifice was again burnt by Phelim O'Neil in 1642, but was restored by archbishop Margetson, between 1663 and 1675. Archbishop Lindsay added, in 1720, an organ, a peal of bells, and expended £7,000 in repairs. In 1729 the building was again repaired; in 1739 the chapter house was rebuilt; in 1761 various alterations were made; but on his accession in 1766 primate Robinson slated the nave, and commenced the erection, under the superintendence of Thomas Cooley, and after the pattern of that at Magdalen College in Oxford, of a tower which, after being raised 60 feet above the roof, was taken down, owing to the yielding of the ancient piers. The present tower and spire were erected by Francis Johnstone of Dublin. In 1834 the cathedral being disfigured by the reparations of the three preceding centuries, primate Beresford engaged the late Mr. Cottingham of London to effect a complete restoration of the fabric, towards which that prelate subscribed the sum of £20,000; the tower was shored up and the piers renewed, the pillars of the nave were made plumb, the plastering was removed from the walls, the pavement and woodwork were renewed, and several of the windows were filled with stained glass. There are no ancient tombs.

The church of S. Mark, erected on an eminence to the east of the cathedral, is in the last Pointed Gothic style, and contains 1500 sittings. The Roman Catholic cathedral now (1854) in course of erection, is intended to be a building of considerable magnitude, in the First Pointed style of Gothic architecture.

The archiepiscopal palace or residence, with a front 90 feet in length, and 60 feet in depth and height, was built in 1770: the royal college, or rather the free grammar school, standing a little north-east of the city, was erected in 1774, at a cost of £5,000; and the observatory (described in the *PENNY CYCLOPÆDIA*, *Supplement*, *s. v.* Armagh Observatory), was begun in 1788 (it was finished and enlarged by primate Beresford): all these edifices are due to the munificence of the primate Robinson, the great benefactor and improver of the city, who gave some fine instruments to the observatory, which he endowed in 1791, and also founded in a Tontine building the public library, which, with some additions, now contains upwards of 20,000 volumes and a valuable collection of manuscripts and antiquities. The seven chapels belonging to various persuasions; the private chapel of the palace, with a tetrastyle Ionic portico, erected in 1781; the adjacent ruins of the Augustinian abbey; the assize courts and gaol, 1780; new sessions house, 1809; the market-house, 1815, at a cost of £3,000; the lunatic asylum for Armagh and three other counties, built in 1824, at a cost of £20,000; county infirmary, 1774; the flesh market, which is worthy of study, built by primate Robinson; and an obelisk 114 feet high,

made of the fine marble quarried in the neighbourhood, and erected by primate Robinson in 1782, to the honour of his patron the Duke of Northumberland, are the chief other architectural objects. The city also contains bridges, barracks built in 1773, schools, four banks, and various other buildings of minor importance. DUBLIN PENNY *Journal*, 1832; *Scenes in Ireland*, London, 1834; WARE, *Antiquities*, fol., Dublin, 1739; COOTE, *Survey*, Dublin, 1804; STUART, *Hist. Memoir of the City of Armagh*, 8vo., Newry, 1819.

R. R. B.

ARMARIUM (sometimes written ALMARIUM and ARMORIUM). The word used by VITRUVIUS (preface to vii), for a piece of furniture in which books were deposited. In earlier times it seems to have denoted a receptacle for all kinds of *arma*, that is, implements or instruments of any description. The armarium was placed in the atrium of Roman houses; and the term has been sometimes used for the money chests found in such apartments at Pompeii. ARMORIUM is explained by DE MOLEON, *Voyages Liturgiques*, 8vo., Paris, 1718 (who also calls it SACRARIUM), as a closet, sometimes placed behind the altar, but properly on the *gospel* or right hand side of it, in which the *ciborium* was kept. MARTÈNE, *Voyage Littéraire*, 4to., Paris, 1717, says that at Auberive the armarium was then kept in the body of the church, on the *epistle* or left-hand side. The word is recognized in the French *armoire*, and in the English almcry or almshouse.

ARMASI in Georgia, see MTZKHÉTHA.

ARMAVRA. An ancient city near Erivan in Persia, now known as *Kara-Kala*, from the village which stands amongst its ruins. It is mentioned by PORTER, *Travels*, etc., 4to., Lond., 1822, who states that "some of its towers, and those of prodigious magnitude, exhibit the finest specimens of the ancient high finished Armenian masonry." He also mentions the tall piers which were once portions of a fine bridge over the Araxes.

ARMENIAN ARCHITECTURE. The edifices in Armenia erected previously to the cultivation of a Greco-Roman architecture by Tiridates III (A.D. 260-314), are not well authenticated as to dates, and are rarely found exhibiting other than a PERSIAN influence; but the works of Tiridates at Kharni or Garni, are ruins that still show constructions in which a veritable Ionic order has been employed. This classic art is said to have ceased with the death of that monarch; the question depends upon the real date of the churches at VAGARCHABAD, which are attributed to the period of his reign, but, although exhibiting a cornice of the Corinthian order, are supposed by some authors to have been built so late as the sixth century of our era, *i.e.* previous to the Saracen conquest in 644. It is, however, generally asserted that, after the death of Tiridates III, the Armenians reverted to a traditional art, which by its massive forms and luxury of ornament and detail, recalls the porticos of PERSEPOLIS, and that, by combining this with the requirements and forms of the Christian churches, they created a style of sacred architecture peculiar to themselves. The total absence of bricks is a mark of Armenian work of that period, although at the same time Byzantine artists were elsewhere always using them, both in alternate courses with stone, and in the interior of their edifices. The church at ARKHOURI, supposed to have been constructed before the middle of the ninth century, the churches of Echmiazin, Sta. Ripsime and Sta. Kajana at VAGARCHABAD, and a few remains in other localities, as the monastery of Sion, near ATENE in Georgia or Karthli, built by the Armenian architect Boghos previous to the year 998, and the monastery of MARNACHÈNE, founded 988 and finished 1029, with the cathedral at ANI, commenced in 1010, offer the best specimens of that style of Armenian architecture which may be called BYZANTINE-PERSIC. This style, excepting in its use of long inscriptions covering the walls, superseded in Georgia a style of art seen in the churches at Rouissy, Lomissa, and Galiert, but passed into a BYZANTINE-ARMENIAN architecture, introduced by the artists and workmen who were sent (as

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his predecessors had sent them since the year 820 to Spain) by the emperor Romanus Argyrus (1000-1050) to his son-in-law the Georgian prince Bagrat IV (1027-1072), as well as to the Russian prince Jaroslav. This style is best studied in the cathedral church at KOUTAÏS, founded 1008-1014, and finished by the architect Maisa 1027-1072; in the church at KERTCHAROUSSE, dating in 1033; in the church of Sta. Sophia at KIEF, founded 1037; and in that at Lavra, begun 1054 and finished 1077. The ornamentation of Koutaïs and the plan of Pitsounda are combined at Ghélathi, in a church belonging to the eleventh century; but art in Armenia ceased on the destruction, not only of Ani, but of nearly every other city in that country, by the Mahometans, in 1064 and 1386, when the population appear to have transferred themselves and their taste through Georgia and Moldavia into Poland, and thence into Russia and Germany. 91.

LAYARD, *Nineveh and Babylon*, 8vo., London, 1853, observes that "there are many interesting questions connected with this Armenian architecture which deserve notice. From it was probably derived much that passed into the Gothic, whilst the Tatar conquerors of Asia Minor adopted it for their mausolea and places of worship. The architect, or the traveller interested in the history of that graceful and highly original branch of art, which attained its full perfection under the Arab rulers of Egypt and Spain, should extend his journey to the remains of ancient Armenian cities. He would then trace how that architecture, deriving its name from Byzantium, had taken the same development in the East as it did in the West, and how its subsequent combination with the elaborate decoration, the varied outline, and the tasteful colouring of Persia, had produced the style termed Saracenic, Arabic, and Moresque. The crusaders brought back into Christendom, on their return from Asia, a taste for that rich and harmonious union of colour and architecture, which had already been so successfully introduced by the Arabs into the countries they had conquered. This connexion between eastern and western architecture is one worthy of study, and cannot be better illustrated than by the early Christian ruins of Armenia, and those of the Arsacian and Sassanian periods still existing in Persia. The union of early Christian and Persian art and architecture produced a style too little known and studied, yet affording combinations of beauty and grandeur, of extreme delicacy of detail, and of boldness of outline, worthy of the highest order of intellect."

DUBOIS DE MONTPERREUX, *Voyage autour de Caucase*, fol., Paris, 1843; TEXIER, *Descr. de l'Arménie*, fol., Paris, 1842. (See *Detached Essay*, ARMENIAN ARCHITECTURE.)

ARMENIUM. A metallic pigment used by the ancients, which took the name of the country from whence it came. It was a light blue colour. A spurious sort, nearly equal to it in quality, was made of a particular sand obtained in Spain and dyed. VITRUVIUS, vii, 5.

ARMENT or ERMENT in Egypt, see HERMONTHIS.

ARMENTIA (MARTIN DE) of Regil, was one of the numerous architects employed from time to time on the Gothic tower of the church of Guetaria, in the province of Guipuzcoa in Spain, until its inclination to one side put an end to further operations. He succeeded to Buztinobinga in 1529, in 1571 took Vicente Zahube as his partner in the work, and died in 1585. 66.

ARMILLA. According to VITRUVIUS, x, 2, this term signified an iron ring fastened round the head of a pile to prevent it from splitting. The term is also applied in the late Latin, Italian, and French languages, to an ANNULET.

ARMKNECHT (PETER) with Johann Thene renewed, after 1333, the *Stiftskirche* at Heiligen-Stadt: the vaulting was completed in 1487, by Johann Weyrauch. 92.

ARMORIAL BEARINGS, see ACHIEVEMENT.

ARMOS is sometimes written for HARMOS.

ARMOURY. The name of an apartment, or suite of apartments, in which instruments of war could be stored until they were wanted for service. At the present time, the word is fre-

quently applied to a species of military museum; such as the armoury for 100,000 stand of arms, beside cannon, at Berlin, considered at the time of its construction (1695) as a piece of faultless architecture; and *la Armeria real* at Madrid, consisting of a gallery, 227 feet long by 36 feet wide, fronting the south side of the palace, and built in 1565, by Gaspar de la Vega, for Philip II, when that monarch removed the collection from Valladolid. At Dresden the armoury has no external importance, but its arrangements may serve as a basis for study; the rooms are separately devoted to implements of mimic war and the chase, tournament or parade armour, arms for service, fire-arms, trappings (which occupy two saloons), oriental weapons, and occidental curiosities. Besides these saloons there ought to be, in any complete edifice designed for such a purpose, entrance halls; waiting rooms for servants; vestibules and corridors; the private offices of the governor, his secretary, and clerks, with waiting rooms to each; two reception saloons; a library; archives; clerks' rooms and waiting rooms devoted to the business of the establishment; cleaning rooms; and a court-yard of sufficient size to admit of the exhibition, perhaps under shelter, of specimens too large or too heavy to be admitted into the building. There is a very fine collection of armour at Paris, arranged in the monastic buildings of the church of S. Thomas Aquinas, the courts, cloisters, and galleries of which seem peculiarly adapted for the purpose.

ARM-REST (Fr. *accoudoir*). A term sometimes applied to the elbow of a stall or bench-end.

ARNAEA or **ARNELEA**. An ancient city in the valley of the Cassaba in Lycia. It is particularly mentioned by several authors, as well as by **TEXIER**, *Descr. de l'Asie Mineure*, fol., Paris, iii, pl. 205, for its remarkably fine basilica, built in the seventh or eighth century. Entrance to the nave is obtained through an exonarthex and a narthex placed between two square towers, which held the staircase to an upper floor for the catechumens: these last buildings were two stories in height. The church has an arcaded nave and aisles, triforium, clerestory, and cupola or flat dome on a tambour pierced for windows. The side chapels next the altar, with a small bema to each, and the octagon building on each side of the church, and communicating with it only, are curious.

ARNAL (**Don Juan Pedro**), born at Madrid, 19 Nov. 1735, studied the fine arts in the academy at Tolosa, where he obtained seven premiums, and having returned to Madrid, gained the second prize for architecture in the first class in the year 1763, in the Royal Academy of S. Ferdinand. This success led to his appointment under the Commission for delineating the Arabian antiquities of Granada and Cordova; on the expiration of that Commission, he was created academico de merito, 2 May 1767; subdirector, 9 Sept. 1774; director of the class of architecture, 20 Feb. 1786; and director-general for three years, 28 Sept. 1801. In 1780, the Royal Press published fifteen drawings of ancient pavements which he had discovered; in 1784, he was appointed architect to that establishment, on designing the works executed in its premises in the Calle de las Carretas; and in 1802, he became architect to the post office, and distinguished himself by the Casa de Postas or general mail office, which he entirely constructed, adjoining to the Madrid post office. The portal of the palace of the Duke of Alba in El Barquillo, the principal retablo of the church of Sta. Barbara at Madrid, and the tabernacle of marble and bronze which he placed in the capilla mayor of the cathedral church at Jaen, are amongst his best minor works. He died 14 March 1805. 66.

ARNOLD OF COLOGNE, see **COLOGNE** (**ARNOLD OF**).

ARNOLD (MEISTER), "out of Westphalia", built 1471-83 the castle (Schloss) at Meissen in Saxony. 92.

ARNOLD OF WUERZBURG, see **ROTHENSTEIN** (**ARNOLD OF**).

ARNOLFO DI CAMPIO, **ARNOLFO DA COLLE**, or **ARNOLFO DI LAPO**, see **COLLE** (**ARNOLFO DI CAMPIO DA**).

ARNOLFO DA MONZA, see **MONZA** (**ARNOLFO DA**).

ARNOLT (**HEINRICH**) is styled a *Rathswerkmeister* and *Baumeister* to the cathedral church at Colmar in the department of Haut Rhin in France, in 1378. 92.

ARNULPH, see **ERNULPH**.

ARONADED (but probably more correctly **ARONDADED** or **ARRONDADED**). A term applied by some writers to an embattlement of which the elevation in outline is formed by an arc placed upon the middle of the otherwise straight top of the crest. 1.

AROSTEGUI (**JUAN DE**) was employed to decide upon the value of the works to the church and convent of Franciscan nuns at Eybar, in the province of Guipuzcoa in Spain, which were left unfinished by Loidi, who began them from the designs of Aramburu, about the year 1606. 66.

AROURA (Gr. *ἀρουρα*). A measure in use among the ancient Egyptians. It was the fourth part of the stadium, being, according to Herodotus, $2\frac{1}{4}$ plethra, or to 1009 geometric feet, or to 10,000 square cubits. It was subdivided into quarters, of which there were sixty-four to the square stadium; that is to say, the length of the aoura was equal to 150 Egyptian geometric feet, or to 100 cubits, or to 30 ampelei, or to 15 acenæ, or to 10 rods. **DESCR. DE L'EGYPTE, Texte** (Antiquités) vii, 335, 525.

ARPAGINETULI, see **HARPAGINETULI**.

ARPENT. A land measure in the old French system.

The arpent des eaux et forêts	=	51.07 ares.
commun	=	42.22 "
de Paris	=	34.19 "
de Genève	=	51.66 "

ARPINO (the Roman **ARPINUM**). A city of the province of Terra di Lavoro in the kingdom of Naples, which, though only visited for its antiquities, contains some remarkable remains of Cyclopean buildings. The walls, built of large polygonal or irregular blocks of stone, are among the most striking specimens of that construction in Italy. The gateway between two walls of the Pelasgic fortress, formed by massive courses projecting over each other till they meet, and then formed into an apparently pointed arch, in a slight degree resembling those at Mycenæ and Tiryns, is one of the most singular monuments of the sort in Greece or Italy. An ancient cistern, some subterranean arches, the cloacæ or common sewers, which are capacious and built in the finest manner, an arch of a Roman bridge across the river Liris, and some portions of pavements, comprise the other objects of antiquity. **CLAVELLI**, *L'Antica Arpino*, 4to., Naples, 1623; **CRAYEN**, *Excursions in the Abruzzi*, 8vo., London, 1838; **KELSALL**, *Journey to Arpino*, Geneva, 1820; **DIONIGI**, *Viaggio in alcuni Città del Lazio*, 4to., Rome, 1809.

ARPORA, **APORA**, or **ÆBURA**. The ancient name of **TALAVERA DE LA REINA** in Spain.

ARRABONA, the ancient name of **RAAB** in Hungary.

ARRACAN, see **ARACAN**.

ARRAGONITE. A remarkable form of carbonate of lime, found in different shapes from hexagonal prismatic crystals to coralloid masses. It varies considerably in colour; is transparent or translucent; and is found associated with gypsum and iron ore. By analysis it shows 95 per cent. carbonate of lime, and about 4 per cent. carbonate of strontian. It is only distinguished from calcareous spar by its superior hardness, and its specific gravity is equal to 2.93. Arragonite has received different names at different periods; the common prismatic varieties have been named *Arragonian apatite*, *Arragonian calc spar*, and *hard calcareous spar*; the pyramidal varieties have been styled *iglit* or *igloit*; the coralloidal arragonite has been called *flos ferri*. Since the time of **JAMIESON**, mineralogists have confused established terms by using the word **ALABASTER** for gypsum or a sulphate of lime, and arragonite for a carbonate of lime, the alabastrum or alabastrites of the ancients; thus the sarcophagus in the Soane Museum, and specimens from Beni-souef in Egypt exhibited at the Museum of Economic

Geology in London, and termed stalagmitic arragonite, are popularly recognized as oriental alabaster. Arragonite may be readily distinguished from calc spar, by exposing them both to heat, when the arragonite will at once fall into powder like gypsum, but the calc spar will remain unchanged. W. H.

ARRAS (Ger. *Atrecht*; the ancient NEMETACUM and NEMETOCENNA). A city in the department of the Pas-de-Calais in France. It ranks among the finest towns in that country, chiefly on account of the modern portion, which contains wide streets of handsome, lofty, and well built stone houses; it has several *places*, the two largest of which are contiguous, and are surrounded by houses supported on arcades. The *grande place* is essentially Flemish in appearance, in consequence of a number of the houses having stepped gables and *attérons*. The effect is rendered still more imposing by one end being occupied by the Hôtel de Ville, built in 1510, chiefly Gothic in its architecture, with a superb and lofty Gothic *beffroi*, but some features of the building are in the finest style *Renaissance*. Part of the Gothic cathedral, destroyed under the Revolution of 1796, is still visible. The present cathedral is of modern Italian architecture, in the form of a Latin cross, with aisles, transepts, and flying buttresses; the choir is admired on account of the slenderness of its pillars and the boldness of its construction. It was formerly the church of the abbey of S. Wast; the monastic buildings still remaining consist of three ample courts, two of which are cloistered; the accommodation is appropriated to the episcopal residence, the college of the Jesuits, the public library with 34,000 volumes, museum of antiquities, and picture gallery. The other public buildings of importance are, the barracks; school for the military engineers; *lycée*; hotel of the prefecture; theatre; and lunatic asylum. Chalk and flint abound in the neighbourhood, but the stone which is used has chiefly been brought from Senlis. QUENTON, *Memoires de la Soc. des Antig. de France*, 8vo., Paris, 1807-1812. W. H.

ARRAS (MATHIEU D', or MATHIAS VON) is mentioned by BERGHAUER, *Protomartyr Penitentia*, fol., Aug. Vind., 1736, i, 370-371, as commemorated by a bust in the gallery of the cathedral or metropolitan church of S. Veit (Vitus) at Prague, with the following inscription:

"Mathias natus de Arras Francie primus Magister Fabricie hujus ecclesie quem Carolus IV. cum electus fuerat in Reg. Roman. in Avenione, abduxit ad fabricandum Ecclesiam istam quam a fundo incepit anno domini MCCCLXII. et rexit usque ad annum LIII et LIII quo obiit."

The ceremony of laying the first stone took place 28 Nov. 1344, and the building was completed by PIETRO ARLERI in 1385. The truly regal castle of Karlstein or Karlstein, about seven miles from Prague, is fully described by MURRAY, *Handbook for Travellers in Southern Germany*, which correctly states that it was begun by Mathias von Arras in 1348, but the termination of the work, which corresponded with the death of the architect, is fixed nine years later, whereas the above inscription confirms the statement generally given of its having been finished in 1353. Although many repairs were required in consequence of various settlements, especially under Rudolph II, the general character of the original design has not suffered much alteration from consequent restorations. BENESSIUS, *Chronie.*; PROCHASKA, *De Secularibus Liberalium Artium in Bohemia et Moravia Fatis Comment.*, 8vo., Prague, 1784; SCHALLER, *Beschreibung der Residenzstadt*, Prague; PRUMISER, *Bemerkungen*, 8vo., Vienna, 1824. 20.

ARRAS HANGINGS (It. *arrazzi* or *arazzi*, from the late Latin term *ARASSÆ*). Lady M. M. Wilton (COUNTESS of EGERTON), editing the *Art of Needlework*, 12mo., London, 1844, observes that the Flemings had been celebrated from the twelfth century for the manufacture of tapestry; that the art had made considerable progress among them in the fourteenth, and had arrived at its perfection there in the fifteenth century; that they established manufactories at various places, that at Arras being more celebrated than any other; that *tapestry was not made at*

Arras until the fourteenth century; and that the productions of that city were so highly prized, that the name Arras became after that period the term for the finest tapestry generally, whether made in Flanders or elsewhere.

JUBINAL, *Les Anciennes Tapisseries*, 8vo., Paris, 1840, speaks of woven stuffs for hangings made in 840, 985 and 1025, at Auxerre, Saumur, and Poitiers respectively; and states that, after the fourteenth or fifteenth century, *tapisserie de haute-lisse*, i. e. with a warp held perpendicularly in the loom, was made in Flanders and England. This agrees with the statements of the *Encyclopédie Méthodique*, fol., Geneva, 1770, that French as well as Flemish hangings were usually *tapisserie de basse-lisse*, that is, with a warp held horizontally in the loom, except at the Gobelins, and that the French were excelled by the Flemish in the *tapisserie de basse-lisse*, which was executed twice as fast as the other. The same author also states plainly that the English carried the fabrication to such excellence, that they deserved to be termed at least the restorers, if not the inventors, of the manufacture. LAMBERT, *Handbook of Needlework*, 12mo., London, 1842. HANGINGS. TAPESTRY. 80.

ARRAVA PONPATHERA. A wood of Tinnevely, East Indies, of a light brown colour, used for building, tools, etc. 71.

ARRECTARIUM. A term used by VITRUVIUS, ii, 8, for a post or pillar standing upright in buildings to receive a weight.

ARRETIUM. The ancient name of AREZZO in Italy.

ARRIAGA (LUIS) succeeded Arroyo, in 1669, as architect to the façade of the cathedral church, and of the Mint, at Cuenca in Spain. 66.

ARRIGHETTI (NICOLÒ) is mentioned amongst the architects who were called upon to give their advice upon the subject of a design for the façade of Sta. Maria del Fiore at Florence, 5 March 1635. MOLINI, *Metrop. Fior. Illust.*, fol., Florence, 1820.

ARRIS or **ARIS** (Fr. *areste* or *arête*). The term used by artificers as synonymous with an *EDGE*, or the line formed by the junction of any two sides of a body which together make an external angle. The word *edge*, and not *arris*, is applied to solid bodies, such as rough blocks of stone or balks of timber, and there is a daily use of the expression "bringing up the edge of any material to an *arris*", i. e. to a sharply defined line; but the term *edge* is otherwise restricted in building to any narrow surface which may be the subject of mensuration. W. H.

ARRIS FILLET. A lath, half batten, or other piece of wood, triangular in section. When used where work is carefully done, so as to raise the edges of slates next to a wall or other object, such as a skylight or chimney stack, it is also called a *TILTING FILLET*. EAVES-BOARD. EAVES-CATCH. EAVES-LATH. 1.

ARRIS GUTTER. A gutter formed in the shape of the letter **V**. 1.

ARRIS-WISE. A term applied to tiles and bricks laid diagonally.

ARROW-HEAD. The name sometimes given to the anchor or tongue placed between the principal ornament of the ovolo, ogee, and other moldings. EGG AND TONGUE. 2.

ARROWS. Laths or sticks about two feet long, shod with iron ferules, have been almost superseded by pieces of thick iron, generally ten inches long, either round or quadrangular, with an eye at the top, and sharpened at bottom, which are placed in the ground to mark distances in measuring with a CHAIN. Ten arrows make a set; they have each a piece of red cloth attached to the eye to render them conspicuous.

ARROYO (JOSEF). He probably designed, and he certainly was engaged upon, the principal front of the cathedral church, and the façade of the Mint, at Cuenca in Spain, from 1664 to 1669, when he was succeeded by Arriaga. 66.

ARRUDA (CAVALIER FRANCISCO DE). He appears to have commenced his career as *maestro-mayor* of the works at the boulevard of Restello at Belem in Portugal, and to have been

employed in the same capacity for the royal works in the town of Evora and district of Alentejo. He succeeded Jago de Arruda, 10 May 1531, in the patent place of measurer (*medidor*); and is recorded to have obtained, besides one pension or salary granted in 1545, another for repairs made to the aqueduct at Evora. 88.

ARRUDA (JAGO DE) was appointed in 1510, by royal brevet (*alcara*), *maestro-mayor* of certain works to the choir and sacristy of a convent in Portugal; obtained the patent place of measurer; and was *maestro-mayor* at Azcomor in 1514. He enjoyed in 1521 the appointment of *maestro-mayor* in the district of Alentejo, having to make the drawings and superintend the execution of all the royal works: and succeeded in 1525 to Martin Lourenço as architect to the palaces at Evora. He died before 10 May 1531. 88.

ARRUDA (MIGUEL DE) was an eminent military architect, engaged at Mozambique, Alcacer, Seinal, and Ceuta in Africa, from 1546 to 1549, and was rewarded on his return to Portugal with the appointment of *maestro* of the royal works in that kingdom, which he held in 1565. 88.

ARSCHINE, ARSCHEEN, or ARCHIN. A Russian measure of length.

Veret.	Sagunes.	Archines.	Verbocks.	English feet.
1 = 500	1,500 =	24,000 =	3,500	
	1 =	3 =	48 =	7
		1 =	16 =	2:4 ins.

ARSENAL, in old authors ARCHINALE (It. *arsena*, *arzana*, *arsenale*, *arsunale*, *darsena*; Sp. *arsenal*; Fr. *arsenale*; Ger. *zeughaus*). A public establishment for the reception of arms and warlike stores. The arsenal at Venice was nearly two miles in circuit so early as 1307-20. It is the only example which will be here mentioned as a work of architecture, it being interesting for the battlemented towers, said to have been built by Andrea Pisano; for the archway which forms the principal entrance, dating from 1460 (the attic was added 1581); for the arcades upon columns forming the workshops; for the ropewalk with its ninety-two Doric pillars; and for the lions, the largest of which was brought by Morosini from the Porto Leone at the Piræus near Athens. ATARAZANA. 28.

ARSENIC. A brittle semi-metal, well known by its colour, which is a steel grey of considerable brilliancy tarnishing on exposure to the air, as well as by its scent when burnt and rubbed resembling that of garlic. The term is loosely applied to the white oxide of arsenic, or white arsenic of commerce, which is used empirically in the manufacture of white and yellow glass. It is also employed as a DRYER by painters. Arsenic was also the ancient name for the combination of sulphur with oxide of arsenic, or the yellow sesquisulphuret of arsenic, now called *orpiment*, KING'S YELLOW; the sulphuret is called *realgar* or *red orpiment*: these are used as pigments, and to produce some of the green colours used in paper hangings. Arsenite of potash is employed in the preparation of arsenite of copper, and is known as SCHEEL'S GREEN, or MINERAL GREEN. W. H.

ARSINOEUM. The name given to a monument raised by Ptolemy Philadelphus to the memory of his favourite sister Arsinoe, in the royal quarter of Alexandria in Egypt. The whole interior, according to PLINY, *Hist. Nat.*, xxxiv, 14, was to have been incrustured with loadstone, in order that the statue of the princess, composed of iron, should be suspended in the centre, but at the deaths of the monarch and the architect Dinocrates, this idea was abandoned; a similar legend attaches to the tombs of Mahomet and of some Eastern princesses. 23.

ART (It. *arte*; Fr. *art*; Ger. *kunst*). In its primary and comprehensive sense, this term implies the modes by which natural productions are converted for the necessities and luxuries of man; in a higher sense, it is used to indicate any process in which the powers of the intellect are exercised; the invention and application of art being the result of reason in man, as distinguished from the unreflecting operations of instinct in the brute.

Art is divided into two branches—useful, and ornamental; the one providing for the necessities, the other ministering to the luxuries and elegancies of life, and the requirements of its intellectual condition. The former is properly denominated SCIENCE when it rises above its simplest form of manual dexterity, and is exercised with calculation and combination, or proceeds upon abstract principles deduced from analysis: the latter is denominated FINE ART, when it is dependent for its results and effects upon the exercise of the more refined and subtle powers of the intellect, viz. the imaginative faculties of the artist and critic; its merit and success arise from the elevation of feeling, refinement, and delicacy with which these are exercised; for its appreciation depends upon the degree in which those to whom it is addressed can comprehend the idea conveyed by the artist. Science, to be true, must admit of absolute demonstration; fine art, on the contrary, eludes any attempt to fix its principles by logical deductions, for though these may be analysed, yet its standard of truth can only be fixed by the universal consent of persons of correct judgment, and refined taste. But art is neither independent of science, nor alien from it, for nothing can be great in art that is not absolutely true in science, so far as this standard of truth can be applied. The facts of science are the sources from whence the ideas of art are drawn, and the materials with which it works; and Fine art does not so much create, as arrange and spiritualize that which already exists; it does not so much counterfeit as transcribe nature, stripping it of what is gross and material, selecting that which is most perfect or to its purpose, and investing it with a specific sentiment and feeling according to the emotions which it is intended to excite, or the impression sought to be produced.

Fine art is divided into different departments according to the vehicle through which it appeals to the imagination. In music it employs the combination and harmony of sounds; in poetry it appeals by glowing language arranged in musical cadence; in sculpture it deals with form and chiar'oscuro alone; in painting it takes the wider range of colour and the illusion of perspective; in architecture it adopts all the means that sculpture and painting employ, and unites them with scientific construction, appropriate ornamentation, and perfect adaptation to the purposes of the erection.

The principles of Fine art are precisely the same in all its departments, and only vary in their applications; the feelings and sensations produced are perfectly identical, but differ in the degree and the rapidity with which they are effected; and art never affects so powerfully as when its various branches are united for one object, or in one composition, each in its proper place, and each in its due proportion, filling as it were its appropriate niche in symmetrical and harmonious combination.

Fine art is divided into various schools, accordingly as it has been modified and influenced by the various accidents of civilization, of religion, of political and social condition, of national character, or even of geographical position. Whether, however, it be the archaic simplicity of Assyria, Egypt or Etruria, the exquisite refinement and stern severity of Greece, or the ostentation of Rome, the deep religious feeling and vigorous fancy of Byzantium and the middle ages, or the teeming inventions of the Renaissance and Oriental art, it is guided by the same principles and amenable to the same laws, but though drawing its materials from the same sources, yet working upon them under different influences, it presents the same objects under aspects so different, and with combinations apparently so opposite, that the uniformity of the principle by which it is influenced, and upon which it is elaborated, is not recognized at the first glance.

The rules of art are the fundamental principles established by the consent, and proved by the practice, of correct and educated taste in every age; being deduced from an accurate and intelligent observation of the effects and results of certain combinations, and an analysis of the causes by which the affections of

the mind are roused or excited, elevated or depressed, they are true in science as well as in art, although the connexion cannot always be traced: they are not the limits within which genius and invention are restricted, but the bounds which these cannot overstep with impunity: they are the conclusions at which the instinct of true genius and correct taste has arrived in every age with unerring certainty: they do not fetter the hand of the artist, but they teach him to marshal, to concentrate, and to direct his powers by the shortest method, with the most striking effect, and with the greatest certainty.

Feeling in art is the thorough appreciation and apprehension by the artist of the subject with which he is dealing, and of the capabilities of the vehicle through which he is conveying his ideas; the identification of himself with his subject, and his thorough comprehension of it in all its bearings. It is that subtle and apparently intuitive exercise of the imagination which enables him to seize a characteristic and leading idea, to reduce it to a tangible and definite form, and to invest his work with the breath of life and with the charms of intellect, a result which when successfully attained is ever the source of the most refined and pleasing sensations that art can produce. H. B. G.

ARTIA (the ancient AMBRACIA). A city of Albania, situate on the left bank of the river Aracthus or Arethus. Pyrrhus made it the capital of his kingdom of Epirus, added to it his palace called Pyrrheum, and otherwise adorned the city. The Cyclopean masonry of the citadel has been used for the substruction of a modern fortress. The principal buildings are the palace of the beys; the convent, A.D. 845, of the empress Theodosia; and a very curious Greek cathedral, founded by Michael Ducas (1071-1078), and dedicated in honour of the Assumption. A plan, view, and section of this last building, are given by HUGHES, *Travels*, 8vo., Lond., 1830. The river is about 200 yards wide, and is crossed by a singular bridge built of rubble masonry, the parapet only being faced with cut stone: the greatest height from the water, which flows through all its thirteen arches, is 92 feet. This city is reported to be destroyed (April 1854).

W. H.

ARTARIO (GIUSEPPE), born at Arcegno in Lugano (son of Giambattista Artario), was a sculptor as well as an architect. He studied at Rome, was employed in several parts of Europe, subsequently entered the service of the elector of Cologne, and died in 1769.

60.

ARTEMA, see VALERIUS ARTEMA. (M.)

ARTESIAN FOUNTAIN, improperly called ARTESIAN WELL (Fr. *puits foré*, *puits artésien*; Ger. *artesischer brunnen*). An artificial perforation made in the crust of the earth, of small diameter, and frequently of great depth, through which water from subterranean reservoirs spontaneously rises and overflows at the surface, often forming a jet. The term is derived from Artesium, the Latin name of the province of Artois in France, where such wells, or rather fountains, are common. Their formation requires a country lying upon rocks of such a structure that water can percolate between different impermeable strata, and be collected in subterranean reservoirs of considerable extent, with a sufficient pressure to raise it above the level of the spot where it is requisite to bore; this pressure may not be anticipated by any but an experienced geologist, who can trace at a distance of two or three hundred miles the outcrop of strata which will give the necessary filter and basin. ARAGO, *Annuaire du Bureau des Longitudes*, 4to., Paris, 1835.

Artesian fountains, thus explained, are mentioned by an Olympiodorus who flourished at Alexandria in the sixth century of our era; and a longer and extensive use of them is attributed to the Chinese. Such fountains of undefined antiquity exist at Stuttgart in Wirtemberg: in France examples exist at Elbeuf, Rouen, Tours, Bages near Perpignan, and at Grenelle near Paris. The celebrated fountain at the Carthusian convent of Lillers in Artois, is said by some authorities to be as old as the year 1126, or even as the seventh century, while others attribute its formation to the engineer Belidor,

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in the middle of the last century. The system had previously to his time been tried in Italy, but is said by JAMIESON, *Mechanics of Fluids*, 8vo., London, 1837, p. 463, not to have been practised in England until 1791, when it is supposed to have been introduced by Vulliamy (RENNIE, in *Civil Eng.*, etc., 1847), and some such wells were sunk in the villages near London. REES, *Cyclo.*, s. v. WELL, mentions one of great abundance and force at Dr. Darwin's, near Derby; and GARNIER, *De l'Art du Fontenier Sondeur*, etc., 4to., Paris, 1822, intimates the existence of another at Sheerness. Dr. BUCKLAND, *Transactions of the Royal Institute of British Architects*, 19 Nov. 1849, restricting the term "artesian well" to what is above called a fountain, declared that there was not one properly so called within three miles of S. Paul's at that time; but admitted that such wells existed at Leamington, Cheltenham, Bath, Otterpool, and Otterbourne near Southampton, and at Watford, whence issues a potent stream of warm water. He also mentioned that there used to be one in the Horticultural Society's Garden at Chiswick, one in the garden of the episcopal palace at Fulham, another at Beaufoy's brewery in Lambeth, and that there might be some even then at Brentford.

The CIVIL ENGINEER *Journal*, vol. iv, and *passim*, contains much information on the subject of artesian fountains, including notices of one at Mortlake, and another at Vienna; the BUILDER *Journal*, vol. ix, cites one of salt water at Kissengen; JEDD, *Theory and Practice of Sinking Artesian Wells*, in vol. v of PAPERS OF ROYAL ENGINEERS; VIOLLET, *Théorie du Puits artésien*, 8vo., Paris, 1840; BUCKLAND, *Geology*, etc., and *Supplement*, 8vo., London, 1837; LES PUITS ARTÉSIENS, an unfinished historical work in many volumes.

ARTESIAN WELL. Every bore made for a supply of water has been usually called by this name; but although a WELL may be sunk to a considerable depth, after which the borer may be used and water obtained, which will not rise much higher than the bottom of the prepared well, this system is not artesian; *i. e.* is not that which has been practised for centuries in the province of Artois in France, where fountains, not wells, are always sought; as observed by BUCKLAND, "an artesian well is one that is always overflowing, either from its natural source or from an artificial tube; and when the overflowing ceases, it is no longer an artesian well." The name may perhaps be usefully employed for a deep well with a bore, small in proportion to the depth, in which water will rise either to the surface or to a height convenient for the operations of a pump.

ARTICLED CLERK. The name applied in some professions to a pupil who would otherwise be called an apprentice. The Act of Parliament 55 George III, c. 184, charges with duty every indenture or other instrument or writing containing the covenants, articles, or agreements, for or relating to the service of any apprentice, clerk, or servant, who shall be put or placed to or with any master or mistress, to learn any profession, trade, or employment, whatsoever: and gives to such indentures between the pupil and an attorney, proctor, solicitor, or writer to the signet, the distinctive title of articles of clerkship, or contract, or indenture of APPRENTICESHIP, apparently in order not to interfere with the term *apprenticiū ad legem*, which, although disused, belonged to the outer or utter barristers since the beginning of the seventeenth century.

ARTIFICER. One who practises the mechanical processes of any art in those portions which require intelligence, taste, and judgment.

1.

ARTIFICIAL MARBLE. The name given to compositions like SCAGLIOLA, and KEENE'S, MARTIN'S, PARIAN, and other cements which receive a high polish.

ARTIFICIAL SLATE, see CARTON PIERRE.

ARTIFICIAL STONE (Fr. *pierre factice*). The name formerly given to TERRA COTTA or burnt clay, so prepared as to be of a stone colour, when used in ornamental work or applied instead of ordinary stone in construction. The term has also

been applied to RANSOME'S PATENT OF SILICEOUS STONE, but it is at present understood to mean a mixture of hydraulic cement and sand, which can be cast in moulds, and will form an extremely hard substance, applicable in the same way as the terra cotta; for it can be used instead of ordinary stone, and when carefully manufactured even for tanks and cisterns, as it does not absorb water. If a highly finished face be desired, it can be worked and sharpened up with the mason's chisel. RANGER'S ARTIFICIAL STONE. AUSTIN'S ARTIFICIAL STONE.

This manufacture has been practised for about twenty-five years. It is, however, more particularly since the year 1830 that the process has been brought into very extensive use. The term is used by MANDAR, *Etudes*, etc., fol., Paris, 1826, for a composition invented by M. Dihl, for covering the brickwork of basins and orange-tree boxes, imitating polished white marble, and ringing when struck with a trowel.

Among the materials at present used in the composition of the articles passing under the name as last defined, are chiefly PORTLAND CEMENT, and PURSE'S CEMENT, though ROMAN CEMENT is sometimes employed. WILSON'S COMPOSITION for artificial stone chimney-pieces was rewarded by the Society of Arts, etc., as detailed in their *Transactions* for 1813. It is mentioned also in PARTINGTON, *Builder's Guide*, 8vo., London, 1825, p. 431.

ARTIGA (DON FRANCISCO DE). A painter and engraver, as well as an architect and civil engineer. He designed and executed the reservoir of the water supply, and in 1690 the building called the university, at Huesca in Spain, in which he endowed by his will a chair of mathematics, whence it may be supposed that, although he had been the professor, he had served gratuitously. He died in 1711. 66.

ARTIGUES (GIUSEPE) was engaged upon the church at Chelva, in the province of Valencia in Spain, from 1657 to 1659, when he completed the sacristy, vestry, and belfry. 66.

ARTISAN. A person who practises the mechanical processes of any art according to some usual routine, his knowledge being limited to the general rules of his trade. 1.

ARTIST. A person who practises ART, either in its widest range or in a more restricted sphere, as in architecture or any other of the Fine Arts. H. B. G.

ARTOBRIGA. The ancient name of REGENSBURG or RATISBON in Bavaria.

ARTOCARPUS. The bread fruit is a genus of trees having stems of very considerable size.

A. chaplasha, and A. hirsuta, in the forests of Bengal and Malabar, yield valuable timber; the latter species, known as ANGELLY wood, is used for ship building.

A. integrifolia, jackwood, in Travancore, East Indies, is used for cabinet work and turnery. In Tavoy are other species not of so much value, known by the native names of *pyinyatha*, *tannabeng*; one called *pinay*, a strong close-grained yellow wood; another called *thouvenben*, a large tree used in boat building, which may be the A. chama (*kangtali chama*) of Gualpara, an immense tree used for the same purpose. The jack tree exudes a great quantity of a viscid milky juice, from which the best birdlime of India is prepared, and a cement for filling up the cracks of vessels for holding water. BOTANICAL MAGAZINE, vol. ii, new series. 14. 71.

ARUNDEL (THOMAS), the second son of Robert Fitzalan, Earl of Arundel and Warren, was born 1353, died 20 Feb. 1413. He was made Bishop of Ely 1374, Archbishop of York 1388, of Canterbury Sept. 1396, and Lord High Chancellor at times from 1386 to 1396. He almost rebuilt the episcopal palace in Holborn, and built, or caused to be built, that at York; as well as the lanthorn tower and a great part of the nave of Canterbury cathedral; in 1406 he founded a chantry in the collegiate church of All Saints at Maidstone, where his portrait still exists. WEALE, *Quarterly Papers*, pl. 13, s. v., *All Saints Church, Maidstone*; BENTHAM, *History of Ely*, 4to., Camb., 1771.

ARUNDEL, Earl of, see FITZALAN (HENRY).

ARUNDINARIUS. A late Latin term, which is translated by BRITTON and BRAYLEY, *Palace of Westminster*, 8vo., London, 1836, as a reed coverer or thatcher.

ARZEROUM, in Persia, see ERZEROUM.

ASAPH, SAINT (Welsh, *Llan Elwy*). An episcopal city in the county of Flint in Wales. The town consists of two principal streets and several smaller ones diverging from them, of well built brick houses, with a stone bridge, having five arches, over the river Elwy. The cathedral was originally built of wood, but when the conflagration occurred in 1282 it was of stone. The present edifice may be considered as the wreck of the structure rebuilt in 1284, as the walls suffered from another fire in 1402; they were renewed, the roof replaced, and the stalls executed, under bishop Rēdman (1471-1495); further repairs were made by bishops Owen (1629-1651), Glemham (1666-1669), Barrow (1669-1680), Fleetwood (1708-1714), and Wynne (1714-1723). The choir was rebuilt by bishop Shipley (1769-1789). The plan is cruciform, with a square embattled tower in the centre, having a staircase turret at the north-east angle. The edifice is 178 feet long, namely, from the west door to the choir 84 feet 8 inches, and from one end of the choir to the other 93 feet 8 inches. The length along the transepts is 108 feet; the width of the nave and aisles together is 68 feet. The choir, 32 feet in width, and transepts, have no side aisles; but in 1833 the choir was lengthened so as to include the space under the tower, 34 feet 8 inches long, and 29 feet 9 inches wide; and a portion of the transepts was cut off to form a chapter house and vestry. The other buildings of any importance are the parish church; the bishop's palace, which is large and convenient, having been rebuilt by bishop Bagot (1790-1802), and enlarged by bishop Carey (1830-1846); the deanery, rebuilt in 1834; four chapels; the free grammar school founded by bishop Hughes (1573-1600); and the almshouse. MOULE and WINKLES, *English Cathedrals*, 8vo., London, 1842. W. H.

ASAPHES UNULATA. A tree of the Cape of Good Hope, producing a very hard and tough wood, called white iron wood (*witte yzer hout*), and used chiefly for waggon work. It grows from 2 to 3 feet in diameter, and from 20 to 30 feet high to the branches. 71.

ASBESTOS. A variety of hornblende which will if heated become after a time so fibrous as to perish in a flame, or at all events to become useless, though, as it is generally supposed to be incombustible, it is at present employed for the wicks of oil lamps, and in the fronts of gas stoves, where it has the appearance of live fuel. Asbestine and asbestoid are names given to species of this mineral; the latter melts into green glass at 150° of Wedgwood. Asbestos is generally found among beds of serpentine. Rigid, common, or short asbestos, flexible or long asbestos otherwise called amianthus, mountain cork, and rockwood or mountain wood, or ligneous asbestos, are some of the varieties which have received names. The term is used by PROCOPE, *De Edif.*, 1, in relation to mortar. W. H.

ASCALON, JULIANUS OF (JULIANUS ASCALONITES), is mentioned as an architect by CONSTANTINE HARMENOPULUS, *Procheiron*, 4to., Venice, 1777, ii, 4, and therefore he probably lived during the fourth century of the Christian era.

ASCALON, ASCULON, or ASCALACUM (the ancient ASHKELON). A ruined city and seaport in Syria, which was very early the seat of a bishop. The fortifications were destroyed and the fort levelled in 1270. Within the limit formerly defined by the walls are the remains of a temple of Greek architecture; of a Roman amphitheatre; and of two churches with white marble Corinthian columns, about 20 feet long, now prostrate. Amongst the other ruins are columns of red, blue, and grey granite, and sculpture in various marbles.

ASCELLA, improperly ASCILLA. A late Latin diminutive term for ALA, as a wing of a building. It is also a late Latin term for shingles or thin boards, being written for ASSELLA. 80.

ASCENDANT. The old term in masonry and joinery for the upright portion of the border, frame, dressing, or other ornament of the opening of a door, window, or chimney; the top or portion over the opening being called the traverse. 4. 13.

CHAMFRANLE.

ASCETERIUM (Gr. ἀσκητήριον). The late Latin term for

a place where athletes performed their exercises, and also for a retreat for ascetics, it became consequently an appellation for a monastery. *SUICER. Thes.*, 547. ARCHISTERIUM. 80.

ASCHAFFENBURG. A town in the province of the Lower Maine in Bavaria. It is surrounded by walls having massive gateways, on every side but that toward the river Maine; the streets are chiefly narrow, steep, and irregular. The castle, called Johannisburg, built of red sandstone on the highest and most commanding point of the town, by an elector-archbishop of Mentz (1605-1614), now forms the usual royal summer residence; it is a large square building with a tower at each angle in the *cinque-cento* style, and has a botanic garden and orangery, open to the public.

The high church, built in 974, contains several fine monuments; its cloister is illustrated by MOELLER, *Denkmäcker*, fol., Darmstadt, 1836, pl. 14, 15, 16. This edifice, the massive buildings of the ancient university, the former mansion of the Teutonic order, and the town hall, are fine buildings: seven other churches, the public library, the picture gallery, and the collection of Renaissance and ecclesiastical remains and casts, deserve particular attention. There are also an ecclesiastical seminary; a lyceum; a gymnasium; a female school; schools of design and agriculture; an asylum, called the Catherine Hospital, for the female poor; a prison; an asylum for the indigent, the infirm, and orphans; an hospital; and a house of industry, all well arranged. W. H.

ASCIA (in late Latin ASSIA, ASSIATA, AÏSSA). The name, according to RICH, *Illustrated Companion*, 8vo., London, 1849, given by the Romans to implements employed in different trades; of these a short handled hoe used for breaking up ground, according to PALLADIUS, i, 43, most resembled the modern ADZE; the instrument mentioned by VITRUVIUS, vii, 7, and PALLADIUS, i, 14, as used by bricklayers for mixing up their mortar, was probably of the same description, c; the tool, A and B, called *ἀσπίον*, said by PLINY, *Hist. Nat.*, vii, 57, to have been invented by Dædalus, and used by carpenters, seems to have resembled the adze, but to have had in addition



a head like a hammer at the back, and the cutting edge slightly curved like a gouge; the hammer was also a portion of the ascia, D, called in Greek by the masons *πίκος* and *πίχης*, which resembled in many respects the modern plasterer's hammer, and as suggested by the *Scolia* on ARISTOPHANES, *Birds*, 1138, had a blade like the bill of a bird. DOLABRA.

ASCILLA, improperly written for ASCELLA.

ASCOLI (the ancient ASCULUM PICENUM). A city in the province of La Marca in the Papal States. The walls, castle, and other buildings, are constructed of *travertino*. The cathedral, dedicated to the Assumption and S. Emygdium, is a modern building of the Corinthian order: there are nine parish churches, besides that of S. Gregorio Magno, which is built of the remains of a Roman temple, and has several columns of the Corinthian order, with capitals of beautiful workmanship. There are also eighteen convents, a *seminario* or college of the Jesuits, two hospitals, the palazzi of several nobles, the *palazzo publico* or residence of the governor, and the *palazzo anizionale*, which contains the theatre, library, and museum.

ASCOLI DI SATRIANO (the ancient ASCULUM APULUM, ASCULUM SATRIANUM). A city in the province of Capitanata in the kingdom of Naples. It contains a fine cathedral, dedicated to SS. Maria and Leo, three convents, an hospital, and a *seminario*. In the diocese is the magnificent abbey of S. Leonard, founded by the emperor Frederic II (1212-1250), which formerly belonged to the Teutonic order.

ASCONDO (FRANCISCO), the son of Antonio Ascondo, was born in 1705, in the parish of Jurrita, in the district of Durango in Spain. He took the lay habit of the Benedictines in 1731, in the class of *maestro de obras*. He designed, and directed in construction, the churches of the priory of Sta. Maria de Duero

at S. Roman de Hornija, and Villardefrades, considerable portions of the monastery at Fromesta, and of the convent of S. Pedro de las Duenas near Sahagun, the house of the *granja* at Fuentes, and another for the viscount de Valoria at Valladolid; the two galleries of the principal cloister of the monastery of his order in that city, imitating those already built in the sixteenth century by Herrera and Ribero-Rada; and another gallery in the same monastery, looking southward over the river Esqueva; and of the *trascoro*, or space at the back of its choir, after he had vaulted (*bajado*) the choir of his convent with great skill. He died in 1781. The usual name given to this architect is Fra Juan. 66.

ASH, see FRAXINUS and PYRUS.

ASHELEY (HECTOR). A famous master mason, whose name is very frequently found in the privy purse expenses of Henry VII and VIII; by the latter it appears he was employed as supervisor in the erection of Hunsdon House in Hertfordshire. VERTUE, *Anecdotes*, 8vo., London, 1826, i, 220; DALLAWAY, *Discourses*, 8vo., London, 1833, p. 378.

ASHES. The residue of substances after combustion. The ashes left from the coals used in the operations of forging are called SMITHS' ASHES, and are used mixed with mortar for the sake of darkening it, when old brickwork is to be repaired or imitated: and where sand cannot easily be obtained, ashes, which should be well ground, are frequently used in the composition of mortar. BREESE or BREEZE. The colour of the blue mortar sometimes used in London for buildings much exposed to the weather, arises from the ashes mixed with it; common ashes mortar is made of lime and wood ashes, in the proportion by bulk of 1 lime and 1½ ashes. CENDRE DE TOURNAY. DRY ROT. MORTAR. SMITHS' ASHES.

ASHLAR, ACHELOR, ACHELER, ACHLER, ASCHELERE, ASHELAR, ASHELER, ASHLER, ASLER, ASLURE, ASSEHLER, ASSHLER, ASTLER, ESTLER (probably corrupted from the late Latin terms ASSELLA or ASSULA). The name given to all stone used for facing work. The Roxburgh Club has printed in its volume entitled *Manners, etc., of England*, 4to., London, 1841, the accounts of the first Duke of Norfolk, 1465-1466, in which, at p. 438, is a passage to the effect that every ashlar was to be 12 inches high and 18 inches long, which multiplied together make 216 inches; and so every ashlar, of whatever length or breadth, contained 216 inches, which was to be the divisor always in measuring ashlars; and the concluding passage shows that the quantity of work was valued by the number of ashlars, using 216 as the divisor of the quantity of stone. The price must of course have depended on the thickness.

The stone, as taken from the quarry, was called *rough* or *penny* stone; it was *scapled* or coarsely shaped with a heavy hammer, then *broched*, or its rough projections taken away, and squared with a pick axe, then *axed* with a broad sharp axe to remove the pick marks, and finally *rubbed* with another stone to wear out the axe marks, when it became, as described by Wynkin de Worde, 'a clene fayre achelore', being hewed, wrought, and smoothed.

Great inconvenience has arisen from the use of the word ashlar without any article prefixed, in which case it means a collection of ashlars. The term ashlar or BASTARD ASHLAR is also applied to stones of various dimensions, which, in order to lessen the expense of carriage, are merely scapled or broched nearly to the required form and size at the quarry, and the word ashlar has therefore been often explained as hewn stone for facing, and as freestone from the quarry. A common ashlar to be backed with rubble or brick, generally measures from 27 to 30 inches on the face, 12 inches in height, and 8 or 10 inches in depth. Unsquared stones of less size have been called PARPIN or PERPIN.

The terms large, small, quoin, common, etc., ashlar, are terms relatively applying to customary scantlings of stones raised in particular quarries. Kent, Caen, etc. ashlar, mark the kind of stone used. The various technical terms applied to the

dressing of ashlar beds, faces, and joints, being those used in general stonework, will be found under the article MASONRY.

ASHLAR WALL. Ashlars when applied as the facings of buildings, ought to be well bonded, and either cramped with copper, as iron corrodes and injures the stone; or dowelled, for which purpose, slate as at A, or stones in cement as at B, are among the materials recently adopted. The height of each course, dependent somewhat upon that of the brickwork by which it is backed, is generally from three to four courses of brickwork, but it depends upon style of design. In ashlar masonry the stability of the work is independent, in ordinary cases, of the mortar; and in dressing the beds, care should be taken not to work them hollow, for pressure thrown upon the edges of the stones will produce unsightly fractures. This kind of masonry is seldom employed where strength is required, as the backing, especially if bricks or other small materials are used, is apt to settle more than the ashlar, and so cause the work to become weak. The best way to remedy this defect, is to set the backing in some hard and quick setting mortar, which is best, or in good strong Portland cement, for Roman cement is supposed to cause an efflorescence on the face of the work. The back of the ashlar should always be irregular, so that many stones in each course should tail into the backing, thus forming a closer union; and *thorough* stones or *bonders* should also be occasionally introduced, forming a more effectual union of the two materials. For the best system of construction, bonding stones, whose front is generally made equal to one-seventh of the whole face of the work, are inserted in the brickwork as it is carried up; this being finished and left to settle, the ashlar is then built against it, and the bond stones or headers are worked down to the general face. In some cases, however, instead of bonding stones, cramping stones are built up in the brickwork, and flush with it. **VENER.**

ASHLARING (often written in old and modern works **ASHLERING**). The short quarterings fitted almost or quite perpendicularly between the floor and the rafters of a garret, particularly in old houses with high pitched roofs. They receive the lath and plastering which thus cuts off the useless sharp angular space at the junction of a floor and sloping side, and vary in height according to the slope of the roof. The Metropolitan Building Act, 7 and 8 Victoria, c. 84, provides in schedule K, that the sloping part of an attic ceiling must not begin at less than 3 feet 6 inches above the floor, nor extend more than 3 feet 6 inches on the ceiling.

ASHPITEL (WILLIAM HURST), born in 1776, was a pupil of D. A. Alexander, and his principal assistant (although then not out of his time) in the survey and designs for the London Docks, and in carrying out those extensive undertakings. He was afterwards for a considerable time a pupil of, and assistant to, the late John Rennie, and was concerned very largely in carrying out the Kennet and Avon canal, and the then novel work of tunnelling under the town of Bath. On quitting Rennie, he entered into partnership with the late James Savage, and afterwards practised for some time alone. His principal buildings were the first new church and the extensive schools at South Hackney; Sir Charles Talbot's house at Deepdene; Chart Park; Shenley rectory; considerable works at North Mimms church, and North Mimms Park; some of the first buildings for the Horticultural Society, and many other similar undertakings, besides several large engineering works. He quitted practice at a comparatively early period, and gave his attention chiefly to improvements upon his own property. He died 20 April 1852. **A. A.**

ASKEATON (in old records **ASKETIN**). A post town in the county of Limerick in Ireland. It was formerly a place of considerable importance, and was strongly fortified. The bridge crossing the river Deel is an ancient structure of five pointed arches, and seems coeval with the adjacent abbey, founded in 1380, which stands on the eastern bank. Portions of the abbey

church, cloisters, and fragments of the conventual buildings still remain; the church is in a very dilapidated state, and the central tower has fallen; the chancel, which is of considerable length, as is usual in most conventual churches in Ireland, has the unusual number of six sedilia, divided by cylindrical shafts. Black letter inscriptions, and slabs with floriated crosses, abound in the nave and chancel; but by far the most interesting portion of the abbey remains is the cloister, which forms a quadrangle of 33 feet square; the coupled shafts, bases, caps, and arches, of black marble brought from Canon island in the Shannon, are executed with the greatest care, the moldings and arrises being still quite fresh and sharp; the horizontal lines of the moldings of the caps and bases are slightly curved, presenting a curious but not displeasing effect.

A portion of the ancient edifice of a commandery of Knights Templars, founded in 1298, is now used as the parochial church. The castle of Askeaton is situated on a rocky islet in the river Deel, and is now a ruin. The banqueting hall is a detached building of two stories, the lower being vaulted with stone, and divided into kitchen, buttery, etc., over which was a spacious and lofty apartment, nearly 80 feet in length and 30 feet in breadth, having five two-light windows on each side, the tracery of most of which is destroyed. **R. R. B.**

ASKEW, now usually written **SKEW**.

ASNAH (more frequently written **ESNEH**). The modern name of LATOPOLIS in Egypt.

ASPALATHUS, the ancient name of SPALATRO in Dalmatia. **ASPATICUM**. A place or apartment adjoining to the ancient churches or basilice, in which the bishop and presbyters received visits of devotion, ceremony, or business. It was also called *aspatium*, *diaconicum*, *mesalorium* or *metatorium*, *receptorium*, and *salutatorium*. **80.**

ASPECT. A term used in speaking of land to denote the quarter towards which it dips or slopes: a southerly aspect is generally sought. The term is used in speaking of buildings to denote the quarter towards which the principal apartments of a private edifice, or the principal face of a public building are turned. In buildings the consideration of the aspect is an important point, either as respects the treatment when it is fixed, or the choice, when this is at the discretion of the architect. When the aspect is fixed, the ornamentation of the building should be adapted to the degree of light to which it will be exposed. For dwellings in which the destination of every room must be considered, the south is acknowledged as the best aspect for living rooms, because with this or with an easterly aspect the windows are not so frequently dulled by showers as if they had a south-westerly aspect; but whether the inconvenience arising from showers is so objectionable as that of keeping sun-shades or blinds closed during a portion of the day, depends very much upon the feelings of the occupants.

A northerly aspect is considered gloomy, yet it is preferred because all scenery looks best when viewed from the south, and by artists for a painting room, because the light, such as it is, is steady. A northern aspect is also preferred for warehouses for soft goods; when placed with a southern or western exposure, the lower parts of the sashes are covered with light blue paper, in order to neutralize the excess of yellow in the sun's light, which causes blues and some other colours to appear to disadvantage. An aspect due east is considered bad, for the reason that the sun shines into the rooms in the mornings only; and a westerly aspect is condemned for the same effect in the afternoon. Country houses in England have generally been placed by Repton, Brown, and Holland, so as to have the following aspects, namely, the principal or entrance front south-west, as being the worst; the principal apartments south-east, as being the best; the servants' offices north-east; and the winter apartments north-west. In general for the country south and east aspects are regarded as only inferior to a south-easterly frontage. In towns it will be found that houses with east and west fronts are generally considered more comfortable than those with north

and south aspects; yet if the lines of streets were drawn north-west and south-west, the sunniness of the two sides would be rendered more equal. In the planning of a house, the morning or breakfast room should be south and east; the drawing room west and south; and the dining room north and west; the kitchens and offices north and east. LONDON, *Encyclopædia of Cottage, etc., Architecture*, 8vo., London, 1839; WILSON, given in *Builder Journal*, vol. ix, p. 789.

W. H.

ASPEN. The English name of *POPULUS ALBA*.

ASPENDUS (called on coins ESTFIDNUS, with the symbol of the three conjoined legs). A ruined city of Pamphylia in Asia Minor, founded by an Argeian colony on the river Eury-medon. Besides the theatre, there are the remains of a basilica, of an agora built by the architect of the theatre, and of a reservoir, and of an aqueduct constructed of pillowed masonry: this last is the largest antique monument of its kind remaining, not excepting the Pont du Gard, and is the more interesting from the fact that it was so built that the water did not run on a level, or rather on a general hanging level, but accompanied the slope of the plain, and remounted the hill in closed channels (see *Detached Essay, Aqueduct*, pl. 1, fig. 10). The edifice now called the Bal-kiz-serai is, according to *TEXIER, Descr.*, fol., Paris, 1849, iii, 218, the finest and best preserved Roman theatre in the world, built of pillowed masonry in large blocks of a breccia or puddingstone, without mortar. The date of this structure seems to be that of the conjoint rule of the emperors Marcus Aurelius and Lucius Verus, A.D. 161-180. The vomitoria, steps, portico, and façade, are perfectly complete, and nothing is displaced but the ceilings, the columns of the scene which are laying on the ground, and the covering of the parascenium or green-room; the traces of the covering of the proscenium, however, are sufficient to mark its slope and position. The back of the parascenium has five doors on the ground floor, with six windows at the level of their heads; above them is a range of nine symmetrically disposed semicircular-headed windows, and another tier of the same number of square-headed apertures; and another story more with twenty-one windows placed in a line, the outer ones being the top of a vertical range of six or seven, lighting the staircases from the basement to the top. The dressings of the apertures, as well as all the interior decorations, are of white marble; two brick pointed arches, which mask the wings of the scene, are supposed to have been erected in the middle ages to take the thrust of the staircases, which seem to have led from the parascenium to three upper floors, to the roof, and to the highly decorated private boxes of the authors, managers, etc.: the machinery must have been confined to whatever could be managed in the wooden floor and roof of the scene; the roof seems to have discharged the water upon the top of the wall of the scene, and it is difficult to understand how its upper part or ridge piece, as restored by *TEXIER*, could have been carried, for it must have been about 127 feet 2 inches long, that being the width between the wing walls of the scene: the diameter of the lower semicircular range of seats is 71 feet 2½ inches, and that between the faces of the columns of the arcade or portico or gallery at the top of the theatre is about 295 feet. The scene consists of two orders one above the other; the frieze of the lower (Ionic) range has heads of victims and festoons, while the upper (Corinthian) tier is enriched with scrolls of foliage below a cornice in which the modillions are placed between caissons ornamented with tragic masks: the columns are placed in pairs under pediments alternately segmental and angular, but in the middle is a larger pediment with a nude demifigure of Venus (Truth, according to *TEXIER*) issuing from the calyx of a flower, with festoons falling in rich scrolls from her hands. The theatre had twenty-one seats in the lower division with ten cunei, and eighteen rows in the upper one with twelve cunei, the staircases being opposite to each other. The portico or gallery consists of fifty-three arcades upon half columns engaged in piers, the capitals being projecting brackets. The two rows of

ARCH. PUB. SOC.

consoled rings for the velarium are perfectly preserved; as also inscriptions in honour of the architect, who was named ZENO.

ASPERSORIUM. The late Latin term for a stoup or holy water basin; also called *aquaminarium*. BENITIER. 80.

ASPHALTE. The French term for an asphaltic rock, which is adopted in England for the name of the several BITUMINOUS CEMENTS or MASTICS employed for pavements, cisterns, and other purposes, which will be mentioned under those heads.

ASPHALTUM. The ancient name for MINERAL PITCH or BITUMEN.

ASPIDOSPERMA EXCELSUM. A tree of British Guiana, producing a very hard, close-grained, light, elastic wood, of eccentric growth, usually known as paddle wood (*yaruri*). It grows from 5 to 6 feet in diameter, about 50 feet in height to the first branches, and has the appearance of being fluted, or as if it consisted of a fasciculus of numerous slender trees. These fluted projections are used by the Indians for the construction of their paddles. The wood is preferred to any other for cotton gin-rollers. 71.

ASPRUCCI (ANTONIO), born at Rome 20 May 1723, was the son of the architect Mario Asprucci, who having lost another son, also an architect, placed the young Antonio with Niccola Salvi, for whom the pupil directed the building of the church Di Gradi at Viterbo. Amongst his own works at Rome were the enlargement of the palazzo Bracciano, on the Piazza degli Apostoli, in which he continued the design of Bernini; the restoration of the monastery of Sta. Francesca Romana, in the Campo Vaccino; and the execution of the church of S. Stefano del Cacco, near the piazza Gesù. He also designed the reconstruction and decoration of the gallery in the palazzo Borghese; a casino on the seashore at Pratica for the Borghese family; and during twenty years the arrangement of marbles now in the Borghese palace. As architect at Rome to the Grand Dukes of Tuscany, he restored their palazzo in the Campo Marzo, and built the vestibules (*portichetti*) in the villa Medici. He was a member of the Academy of S. Luke, and died 14 Feb. 1808. TIPALDO, *Biografia*, 8vo., Venice, 1835, ii, 427.

ASPRUCCI (MARIO), the son of the preceding, was born in Rome 10 December 1764, and obtained in 1786 and 1781 the prizes in competition offered by the Academy of S. Luke. He erected at the villa Pinciana, for the then head of the Borghese family, the *portone* or great doorway, the temples of Æsculapius and Diana, and a church in the garden called Di Siena, the buildings around which he rearranged. He also designed a house (Ickworth?) built by Frederick Augustus Hervey, fourth earl of Bristol, and died 7 May 1804. TIPALDO, *Biografia*, 8vo., Venice, 1835, ii, 435; GAGE, *History, etc., of Suffolk*, 4to., London, 1838, p. 306.

ASSA, improperly written for ASSIS.

ASSA CELLA, or ASSACELLA. The word *assa* literally means anything roasted; whence its use by *CICERO, Q. Fr.* iii, 1 (the only classic writer who employs the term), is explained as meaning that chamber in a set of baths in which the air was made excessively hot, to promote violent perspiration. 80.

ASSALE, see ASSER and ASSIGIA.

ASSAMA. A valuable wood, so called in Canara, etc., East Indies, see BRIEDELIA. 71.

ASSAMENTUM. The word used by *PLINY, H. N.*, xvi, 40, to signify a plank.

ASSECONIA. The ancient name of SANTIAGO DE COMPOSTELLA in Spain.

ASSELLA, sometimes written ASCELLA and AXILIA or AISSELLA (Fr. *asseille*). The Latin diminutive of ASSER; it was employed to express shingles or thin boards. 80.

ASSEMBLAGE is an old term in carpentry and joiners' work, for the junction of pieces, especially in the framing of a roof: thus a mortise and tenon was a species of assemblage. 1. 4.

ASSEMBLAGE OF THE ORDERS. The technical term for the use of two or more orders in the decoration of a building, when one is placed above the other. APPLICATION.

ASSEMBLY ROOM. The room or suite of rooms appropriated to the reception of large parties, for balls, etc. From the time of James I, most county and corporation towns have had some large hall serving for the purpose of dinners, concerts, and spectacles, and which afterwards was used for balls: but the custom of holding balls on certain occasions, seems to have given rise to edifices expressly built with all the necessary accommodation. Perhaps the first such structure in England with any pretension to architectural display was the assembly room at York, designed by Lord Burlington, 1695-1753; it is shown by WOOLFE and GANDON, *Vitruvius Britannicus*, iv, 78-81, and may still serve as a model for study and improvement. The assembly room at Glasgow, built by Robert and James Adam, is far more convenient and important: it is given by RICHARDSON, *New Vit. Brit.*, i, 8, 9; and the town hall and assembly rooms at Newark, by John Carr, are illustrated in the same work, ii, pl. 14, 15. The foreign building which most resembles the English assembly room is perhaps the *curseal* of the German Spas; a very good example at Brueckenau, is given in the *Bauzeitung Journal* for 1841, which also contains the *Festsaalbau* of the palace at Munich (1842), built for nearly analogous purposes; and the casino at Copenhagen (1850), in which a stage for theatrical performances is included. Any complete edifice designed for such a purpose should contain, besides the great ball room, a smaller one for parties when the company is not numerous, a supper room, card rooms, a tea room, at least two dressing rooms, a *crush room*, as it is called, or gallery for visitors waiting to leave, an entrance hall with an inner vestibule, a parlour, with housekeeper's and store rooms, a kitchen, pantry, and servants' rooms, the needful closets, and a large place of shelter for servants waiting for the visitors. **BATH.**

ASSER. This word is used in different senses by VITRUVIUS, who employs it, iv, 2, for the small or common rafter carrying the tiling of a roof, where he states that it is this which is said to be represented externally by the dentil of the Ionic order; but the same author uses it (vii, 3) for the battens, centering, or bracketing, which form the outline of a vault. The diminutive *asserculus* or *asserculus* is employed by COLUMELLA, xii, 50, for a ceiling-joint or batten-lath.

ASSES' EARS. A term employed by artificers for ACROTHERIA of the particular form indicated by the name.

ASSIDUA and AUSIDUA. The late Latin words corrupted from *absida*, for that part of a church in which the altar was placed. 80.

ASSIGIA (Fr. *assiche*). The late Latin term for a pale in fencing, or a plank in campshedding. 80.

ASSIS, also improperly written *axis* in VITRUVIUS, iv, 2, and *assa* (It. *asse*, *tavola*; Fr. *ais*, *aisse*, *planche*). The late Latin term for battens or thin boards, such as are used in forming fences. 80.

ASSISI (the ancient *ASISIUM*), one of the most interesting and instructive of the mediæval cities of Central Italy, is situated in the delegation of Perugia, in the States of the Church. Its municipal rank and consideration during the Roman period, are attested, not only by numerous inscriptions, and other minor antiquities, but by the remains of baths, and the noble portico of a temple, formerly dedicated to Minerva, the record of which is still preserved in its present name. It was early converted into a church, and is now called Sta. Maria della Minerva. The portico has six fluted columns of the Corinthian order of white marble, with an enriched entablature and pediment, and originally formed part of a hexastyle systyle temple; three sides of the original cella still remain, the fourth has been restored. WINCKELMANN observes that it is the only antique edifice in Italy in which each column has its own stylobate; the same feature is seen in two buildings at Palmyra. The raking cornices of the pediment have neither the modillions nor the dentils of the horizontal entablature, their

places being supplied by richly decorated moldings. Dentils are also found in the cornices of the pedestals. W. H.

The town itself is picturesquely situated on the ascent and summit of a hill, one side of which is precipitous and lofty; the substructures to the great churches of S. Francesco and Sta. Chiara, and the battlements crowned with the ruined citadel at the very summit of the hill, give it altogether a grand and imposing appearance.

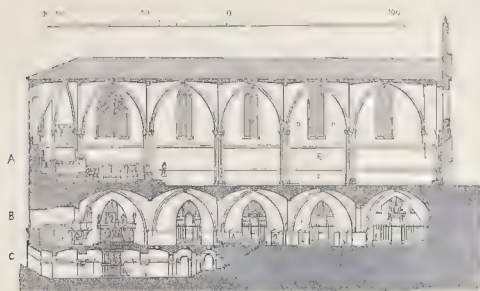
It is an episcopal seat, and the duomo, which dates from the early part of the twelfth century, is dedicated to S. Rufino, its first bishop, A.D. 240; the crypt is of the eleventh century; the Romanesque façade with its wheel window still remains, but the interior was modernized by Galeazzo Alessi in the sixteenth century. An antique marble sarcophagus serves for the altar. The stalls are fine specimens of carving, and the panels in the backs of them are said to have been executed from designs by Raffaello. Behind the cathedral are the vestiges of an aqueduct, and the outline and some remains of the cunei of an amphitheatre of no small size, are still distinctly traceable in the heart of the moderna city.

But the glory of Assisi, and the chief attraction to all lovers of art, is the so-called triple church of San Francesco, the *Sugro Convento* built to enshrine the remains of the saint, who was a native of this town. The church is remarkable in the history of architecture, having been erected by a foreign artist in a style then quite unknown to Italy, the testimony of VASARI being generally considered conclusive, that it was designed and carried out by a German, "Jacopo Tedesco", in the years 1228-1230, soon after the canonization of the saint in whose honor it was erected.

The arrangement also is peculiar, there being a subterranean chapel or *confessione*, c, beneath two churches of almost equal extent built one over the other, a and b; the lower one originally formed the mausoleum of the deceased saint, while the upper one was appropriated to the religious services of the monks. Advantage was taken by the architect of the rapid fall of the ground to carry out this distribution, and the result is that there are three churches one above the other, each entered at different levels. The lower of the three, c, may more properly be described as a crypt hollowed out in the rock, in which the body of S. Francis is deposited; it is modern, having been enlarged by Brizi in 1820 (MORONI, *Diz.*), when this mysterious crypt, and now third church, was discovered and opened, it having previously remained closed to all and sacred from intrusion from the period of its consecration in 1253. The length is about 92 feet from step to step; the extreme width under the transepts of the *upper* church, where the altar tomb stands, is about 60 feet, and the height is about 17 feet. It is now entered both from the middle church and exteriorly from the conventual buildings, and harmonizes but ill with the solemn character of the church above.

The *middle*, or as it is commonly termed, the *lower* church, n, is entered from the north side; it is Romanesque in style, and consists of a nave and two aisles, divided by massive piers and circular arches, with transepts and apsidal end. Its length and width are about the same as the *upper* church, but the height differs greatly, the piers being only 9 feet 6 inches high; the height to the crown of the semicircular arches 26 feet, and the height to the intersection of the ribs of the vaulting about 34 feet. Low in proportion, it is also gloomy in effect, so much so that until the eye becomes accustomed to the dim light, it is difficult to obtain a glimpse of the masterpieces with which its walls are covered. Originally the aisles, which form side chapels, did not exist; but Filippo di Campello, a brother of the order, who succeeded Jacopo as architect, added them for the purpose of increasing the mysterious gloom of the building, in which intention he certainly succeeded admirably. The walls and vaulting are entirely covered with fresco paintings, embracing, amongst others, some of Giotto's masterpieces. The entrance doorway, a fine bold

design, is divided into two openings by richly clustered shafts, with trefoiled arches over them, within a deeply molded and enriched pointed arch; the arch head is filled in with the wheel window engraved in pl. 73, fig. 6, with two smaller circular cinquefoiled openings at the sides, the spandrels are filled in with foliage; the whole is in marble, inlaid with brilliant mosaic, and the enrichments carved with great delicacy. The window of the chapel opposite is filled with stained glass by Bonnino, who was also employed at the cathedrals of Orvieto and Siena.



A, Upper church; B, Middle or Lower church; C, Subterranean chapel or crypt; D and E, wall covered with figure decorations; F, also with diaper patterns.

The upper church, A, which is entered by a western doorway, consists of a nave, apse, and transepts, but has no aisles. The extreme length in the interior is about 245 feet; the width is about 40 feet; the length along the transepts is 98 feet, and the width is the same as that of the nave. The height to springing of arches is 33 feet 6 inches, and to the intersection of the ribs 61 feet. The nave is divided into four bays, with groups of clustered columns; it is vaulted and groined, and lighted with narrow two-light windows. The transepts have three-light windows only at the ends; the apse is semicircular. The windows are filled with stained glass, executed by order of Sixtus IV by Fra Francesco di Terranuova and Ludovico da Udine in 1476 and 1485, of which a specimen is given in pl. 22. The vaulting and walls generally are decorated by Cimabue and his pupils: the vaulting has alternately gold stars on a blue ground, and medallions containing the four doctors of the church, the four evangelists, and lastly our Saviour, the Madonna, John the Baptist, and S. Francis; the ribs and groining being decorated partly in imitation of mosaic decoration, and partly with rich bands of foliage, flowers, etc., in which red and green are predominating colors. Examples of the vaulting, in colors, are given by GRÜNER, *Ornamental Art*. Beneath the windows are painted subjects from the life of S. Francis, and lower still the diapered patterns in imitation of tapestry hangings, of which specimens have been given in pl. 7: these diapers must be of the same period, as amongst numerous names, versicles, texts, etc., scratched upon them, many occur in gothic characters, frequently dated in the beginning of the fifteenth century, and one as early as 1383. The pulpit engraved in pl. 50 is from the upper church, and, in common with the whole interior, has been richly decorated with color. Traces of this are still visible, and a restoration has recently been published by GAILHABAUD, *Arch. du v au xvii Siècle*. The stalls in the apse are in the best style of Andrea Sansovino, by whom they were executed in 1501: the style is the transition from expiring Gothic art to the Renaissance; the canopy to each is composed of a gable, with crockets and finials, separated by small pinnacles. They are richly carved and inlaid with some admirable examples of Italian intarsiatura or marqueterie, representing scripture subjects and portraits of various prelates and monks. The high altar, which is modern, is surrounded with four marble statues of kneeling angels, but the bishop's throne is contemporary with the original structure, and is adorned with the usual marble lions

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as rests for the arms. The façade is richly decorated with marbles and sculptures; and a curious instance, if any proof were needed, of the northern feeling and origin of the architect, is evident from the fact that, in accordance with the custom of the north, he has designed and executed a high-pointed gable,—which is, in fact, utterly useless and unsuited to the climate,—whilst the roof behind is of the usual low Italian pitch. This roof is probably the work of Pintelli or Rosellini, to whom MILAZIA, in *Vite*, ascribes the rebuilding of the church and convent; but their works are specified in the memoirs by VASARI, who states that as the church was in some parts greatly damaged, and in others threatened to fall, Rosellini repaired and strengthened the building most thoroughly, covering it also with a new roof (this is presumed to have been between the years 1447 and 1455, but might have been as late as 1470); and that in 1480 Pope Sixtus IV, hearing that the church and convent were in danger of falling, sent Pintelli, who constructed so massive a range of buttresses in support of the portion endangered, that he rendered the whole of that wonderful fabric perfectly secure. The same pontiff had previously added to the convent several halls and chambers, easily recognizable from the armorial bearings.

The table given in pl. 34 is without doubt a relic of the same period as the church itself, and possibly executed from a design by Jacopo or his successor Filippo, inasmuch as it is in the convent. Jacopo was sent by the Emperor Frederic II to Frate Elia, the general of the order, and successor to S. Francis. The general admiration excited by this building, insured the adoption of the pointed style in Italy; and the church of Sta. Chiara in this city, by Filippo di Campello, built in 1253, bears traces of the influence exercised by it. This church still retains the fine wheel window engraved in pl. 73. The church called Chiesa Nuova occupies the site of the house in which S. Francis was born. GWILT, *Notitia Ital.*, 8vo., London, 1818, mentions a fountain by Michelozzo.

In addition to the churches already enumerated, Assisi contains fifteen others, though the population does not exceed six thousand persons. A short distance from the town, on the road to Perugia, stands the church of Santa Maria degli Angeli, built from the designs of Vignola by Galeazzo Alessi and Giulio Danti, as a protection to the small gothic chapel in which S. Francis laid the foundation of his order. The fact of the ground occupied by this small oratory having been presented to him by the Benedictines, occasioned the present church to be called by the name by which it is sometimes known, the Portiuncula. It was all nearly ruined in 1832 by an earthquake, which entirely destroyed the cupola and tower; and though it has been repaired and partly restored, it is now impossible to judge of the original effect.

J. M. L.

GALLY KNIGHT, *Ecclesiastical Architecture of Italy*, fo. Lond. 1814; BRUSCHIELLA, *Assisi Città Sacralica*, etc., 8vo, Rome, 1821; ANGELI, *Collis Paradisi Amœnitas*; ANTOLINI, *Il Tempio di Minerva*, 4to, Milan, 1803; there is also a set of illustrations of the church of S. Francesco, etched by Mariani, from the drawings of a resident architect, Lorenzo Carpinelli. GAILHABAUD, *Monumens Anciens*, etc., 4to., Paris, 1849-52, pl. 36, 37; VASARI, *Vita*, etc., Arnolfo di Lapo, Rosellini and Pintelli; SEROUX D'AGINCOURT, *History of Art*, etc., fol., Lond., 1847.

ASSIZE COURTS. The name given to the edifice erected for the accommodation of the officials and the public at the sessions of the judges of the superior courts, held under the Acts 13 Edward I, c. 3, 1 William IV, c. 70, for the purpose of making gaol-deliveries, and for the trial and dispatch of all matters civil and criminal, in the principal towns of each county of England and Wales, except London and Middlesex, wherein the administration of justice is regulated by peculiar customs and Acts of Parliament.

Any complete building designed for such a purpose requires a large hall, which may be so extensive as to be suitable for public meetings, with galleries and a *pulpitum* or stage for

2 F

the conveners of the meetings, leading out of a private or committee room; accommodation for two courts of justice, one for civil, the other for criminal trials, with at least a retiring room for the Bench of each, and in some cases a third apartment, for the members of the lieutenancy, with a private carriage entrance, and accommodation for attendants; a grand jury room; a petty jury room; an office for the clerk of the peace, with another for his clerks, with a separate entrance for these parties and their servants; rooms for the persons interested in the trials, the opposed witnesses, counsel, and solicitors or attorneys; cells for prisoners, and the requisite conveniences for the constables; and strong rooms for records, etc. The Basilica, as it was called, or county courts of justice for the county of York, built in 1774, in the castle yard at York, by John Carr, and the assize courts for the county of Stafford, erected by John Harvey in 1794, are given in RICHARDSON, *New Vit. Brit.*, fol., London, 1808, vol. ii, pl. 1-4; 7-10. The latest erected building, solely devoted to these purposes, which has been published, is perhaps that for the assize courts at Cambridge, designed by Messrs. Wyatt and Brandon, and given in the *BAUZEITUNG Journal* for 1848, pl. 185. Admirable plans, etc., of like edifices in France, will be found in GOURLIER, *Choix d'Edifices*, etc., fol., Paris, 1825.

ASSOCIATION. The law of attraction of ideas. This is one of the mental phenomena, which is placed after sensation and perception on the one hand, and judgment and memory on the other. It is generally explained as the connexion and arrangement of ideas, acting as agents to all the above mentioned powers of the mind, and as influenced by the principles of resemblance, contrast, contiguity in time or place, and causation. It is therefore one of the leading conditions of the mind, when any subject is submitted to criticism, and forms one of the bases upon which works of architecture are decided to possess CHARACTER. 14.

ASSOS (now *Bairam Kalesi* of WALPOLE, *Beyrham Keni* of TEXIER). An ancient and ruined city on the gulf of Adramyti, in the pashalic of Anatolia in Asiatic Turkey. It was apparently discovered in 1801, by Dr. HUNT and Professor CARLYLE, whose description appeared in WALPOLE, *Memoirs relating to Asiatic Turkey*, 4to., London, 1817, p. 126, and has been fully illustrated by TEXIER, *Deser. de l'Asie Mineure*, fol., Paris, 1849, vol. ii.

The walls are among the best examples of such Hellenic constructions; they are about five miles in circuit, built of large blocks of TRACHYTE, without cement or mortar; one bastion is partly built of cyclopean masonry with irregular joints, but the remainder of it, like all the rest of the walls and towers, is in regular courses, rusticated in portions; there is one semicircular arch, perhaps a Roman construction, in a tower semicircular on plan. These walls are constructed in a manner which has hardly been observed in other antique remains (PÆSTUM), namely, of two faces with an interval between them and through stones at distances. Three of the gates remain nearly entire; the principal one, at the north-west side of the city, consists of two towers projecting before the portal; the gate posts, 3 feet thick, had no rebate, and there was a small enclosure behind the entrance, which is about 10 feet wide by 13 feet 8 inches high, and is curious from having brackets or *culs de lumpe* under the lintel. Outside the town there is a false pointed arch of corbelled stones; and inside the gate there is one of similar construction, but semicircular in shape; both are 4 feet 8½ inches deep. This gateway is given by TEXIER, pl. 110, 110 b; and in pl. 111 are the drawings of two other gates of minor importance, the larger having the faces of the towers rusticated, but plain on the sides; the other being a small postern near the great gate, with a three-sided head of five courses high in corbelled masonry, projecting 6 feet 1 inch, another example of which exists in the theatre of Iassus in Caria. The flight of steps leading from the cemetery and harbour, with



the ruins of the principal gateway, are indicative of a magnificent structure.

A steep and well defended ascent led from the stone mole of the port to a platform forming the necropolis (marked by numerous sarcophagi of Greek style, which have been opened, and remain in their places, with their covers *à oreillettes* broken), and thence by a long flight of steps, also fortified, to a terrace and porticos, and to the last mentioned gate.

On the brow of the acropolis, besides military constructions in cyclopean work (opus pseudisodorum), the three travellers found the remains of a Greek-Doric hexastyle peripteral temple, with six columns in the anticum, two in the posticum, and thirteen columns on the side. The pillars were 3 feet 5½ inches in diameter, and about 14 feet 5 inches high, with sixteen flutes, and considerable entasis: the bases were in their original position, and TEXIER has cleverly shown that the fragments of sculpture, now in the Louvre at Paris, belonged to the architrave; these consisted of two couchant winged andro-sphinxes with female heads, each of them resting one foot on a kind of candelabrum placed between them, of bulls combating, of a lion devouring a kid, of Menelaus fighting with Proteus, of centaurs, of the marriage of Peirithous, and similar subjects in an archaic style. TEXIER, pl. 112-114 c. The same author assumes that a terra cotta or metal cymatium was placed on the pediments; the upright face of the corona ends with a hollow under a reversed ovolo; and there are other minor variations from the recognized standards of the order; for example, there is a fillet at the bottom of the architrave, and the bands for the guttæ are not cut.

A well constructed *œdicula*, or small building sometimes called a *NYMPHÆUM*, of four arcades on pilasters, stands lower down the hill; as does a Greek theatre, about 131 feet 3 inches in diameter, with all its seats, but having the proscenium chiefly in ruins: some large blocks are supposed to mark the *thymele* or place for the musicians. Besides these ruins and the remains of an agora, gymnasium, and columns and architraves of an extensive Doric portico facing the sea, of sarcophagi with festoons in relief, and of black pottery, the visitors found a Byzantine church on the acropolis, with an inscription appearing to state that this building had been reconstructed under Anthimus, bishop of Scamandria. 14.

ASSOUAN. The modern name for SYENE in Egypt.

ASSOUR, in Egypt, see *MEROE*.

ASSULA or **ASTULA** (It. *scheggia*, *scaglia*; Fr. *éclat*). The Roman term for a shard, spill, shiver, or chip of any material; employed by VITRUVIUS, vii, 6, for the chippings of marble or stone work; but by COLUMELLA, vi, 19, for a small slab.

ASSUMPTION, **ASUNCION**, or **NUESTRA SENHORA D' ASSUMPCAO**. The capital of the State of Paraguay in South America. The city, built of wood until its destruction by fire in 1543, is ill-built and irregular, with crooked and unpaved streets, containing houses built of clay. It was created a bishopric in 1537, and contains a cathedral, three churches, four convents and monasteries, a theological seminary, a college, and an hospital. 14. 50.

ASSURANCE OFFICE, see *INSURANCE OFFICE*.

ASSURANCE (L') or **LIASSURANCE**, see *CAILLETEAU*.

ASSUS. In its original sense, this word signified single or alone, whence *ASSI LAPIDES* meant stones placed upon each other without mortar, *i.e.* dry rubble. SERV. *Ad Virg. Georg.*, ii, 417.

ASSYNT MARBLE. A white and greyish-white British marble, found in, and taking its name from, the parish of Assynt in Sutherlandshire. SOCIETY OF ARTS, *Transactions*, xxviii, 8vo., London, 1811, p. 59.

ASSYRIAN ARCHITECTURE. As the interest and utility to the architect in studying the works preserved in the ruins of the Assyrian cities, must in a great measure depend upon some approach to a chronological arrangement of those remains, it seems desirable to submit an attempt to give the

order of succession of the monarchs, and approximate dates, with the names of the buildings in which they are recorded. A comparison of the statements made by RAWLINSON (*ATHE-NEUM Journal*, 1854) and others, leads to the belief in the foundation of the Assyrian empire about 1273 B.C.; and in the existence of about thirty monarchs, who may be classed under the heads of the upper and the lower dynasties.

The ten first of the following names are supposed to be those of the earliest monarchs, being found at Ellasar or Kalah Shergat, the Telene of Greek writers, which seems to have been the metropolis of the Assyrians during the first years of their emancipation from the rule of the Arab successors of the Chaldean or first Babylonian monarchy.

The upper Assyrian dynasty, usually called the Ninus (Nineveh) dynasty, includes the names of Bellukha; Pudil; Phallukha I; Shalmabar; Sandapal....; Assurdapalil, B.C. 1190; Mussaggilnebo; Assurishpan; Tiglathpileser I, B.C. 1130;^A Assurbanipal I; Assuradampali;^B Assurdanil; Phallukha II; his son Tiglathanda;^C his son Assurakhsaal or Assurakhsaal, formerly called Assurdanipal or Sardanapalus I by RAWLINSON;^D his son Shalmanubar or Temenbar, formerly read Divanubar;^E Shamasphal, Shemasadar, or Shamsizar; and his son Phallukha III,^F the Ninus of RAWLINSON, presumed to have been the last monarch of the upper dynasty, as his successor does not record a royal genealogy.

A. The name of this monarch is seen in temples on the north of the mound at Nimroud, and on tablets at Bavian, that of his successor is on a mutilated female statue lately found at Nineveh (here RAWLINSON supposes the probability of the future insertion of some yet undiscovered names, or the introduction of the first four above given).

B. This name is on a fragment of an obelisk lately discovered at Nineveh.

C. A famous warrior; no monuments found.

D. The mass of the inscriptions in the north-west palace at Nimroud belong to this monarch; his name is found at Abou Maria.

E. Is recorded on the black obelisk now in the British Museum, as contemporary with Jehu (King of Israel, B.C. 884-856), and is found at Baasheikhah or Baasheikhah (NINEVEH), and on the backs of the bulls in the centre palace at Nimroud, and at Kalah Shergat.

F. This monarch's name, with that of his predecessor, were found in the upper chambers on the west face of the mounds at Nimroud, and he is allowed by nearly all writers to have been the Pul or Phul of Scripture, the Phaloch of the Septuagint, and to have defeated Menahem (King of Israel, B.C. 770-764). According to RAWLINSON, an inscription found in the south-east palace at Nimroud leads to the supposition that the Atossa or Semiramis I of the Greek historians, was the daughter of a king of the Medo-Armenians, reigned with her husband Phallukha as joint monarch at Nimroud until his death, and afterward became the sovereign of Babylonia. Some writers regard the period of Phallukha's death as that of the fall of the Sardanapalus of Greek historians.

The lower Assyrian dynasty comprises the names of Tiglathpileser II, or Diglathpulasser, B.C. 753 or 747;^G Shalmaneser, or Enemessar, B.C. 740 or 730; the usurper Sargina, or Sargon,^H B.C. 734 or 721; his son Sennacherib;^I his son Esarhad-don,^K B.C. 683 or 680; his son Assurbanipal or Sardanapalus II;^L then perhaps Saosduchius, B.C. 667, and Chyniladanus, B.C. 647; Nebuchodonosor, probably Saracus or Sardanapalus III, who reigned fifteen years, is supposed to have been the son of Assurbanipal II, to have built the south-east palace at Nimroud, and to have burned himself and his palace of Koyunjik, B.C. 625, on the conquest of Nineveh, and consequently of Assyria, by the Babylonian monarch Nabopolassar. This is the Ninus II of ABYDENUS.

G. This name is found in the centre palace, and in removals to the south-west palace at Nimroud.

H. Built the palace at Khorsabad, and his name is seen at Nimroud, Karamless, etc.

I. Was contemporary with Hezekiah (King of Israel, B.C. 720 or 702) and built at Koyunjik, etc.

K. Built the south-west palace at Nimroud; and an edifice now covered by the mound called the Tomb of Jonah at Mosul; and a palace for his son at Shereefkhan, near Koyunjik; he is the monarch named on the black stone in the possession of the Earl of Aberdeen.

L. RAWLINSON observes that a new palace belonging to this monarch has just been discovered (1854) at Nineveh, "the sculptures of which, both in beauty and design, and in the elaborateness and skill of their execution,

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are far superior to any monuments previously found in Assyria." He added to the palace of Sennacherib at Koyunjik.

The Babylonian dynasty comprised Nabopolassar or Ahasuerus I,^M B.C. 623; Nabukudurussur or Nebuchadnezzar,^N B.C. 605; and a few more princes, including his son Ilarudamus, Abilberodan, or Evilmerodach; his brother-in-law Nergalsharzar or Nericolassar; his son Laborosarchod; Nabbonad, Nabunit, or Nabonidus;^O and his son Belshazzar or Belshazzar.

M. This name is found at Khorsabad and at south-east and south-west palaces at Nimroud, where he plundered the north-west edifice.

N. Found at south-west palace at Nimroud.

O. Found at Koyunjik, and south-east and south-west palaces at Nimroud.

The Persian dynasty comprised Cyrus, B.C. 536; and Cambyses, B.C. 529.

Found at south-east and south-west palace at Nimroud.

Such are the names found in the localities above attached, according to LAYARD and RAWLINSON; but with the reservation of uncertainty as to the least important dates, GROTEFEND differs almost entirely in the interpretation of the names. Dr. HINCKS, *Literary Gazette*, 22 April 1854, seems to agree with the other British authorities in the present condition of ancient oriental chronology, upon the bases of comparison offered by the synchronisms of Jehu, Menahem, Hezekiah, and Cyrus, but substitutes an entirely different mode of spelling the regal names.

LAYARD, *Nineveh and its Remains*, 8vo., London, 1849, ii, 285, conceives the Assyrian influence in Asia Minor to have been twofold: "In the first place, direct, during the time of the greatest prosperity of the Assyrian monarchy or empire; in the second, indirect, through Persia, after the destruction of Nineveh"; and, in a subsequent passage, the same author notices traditions of the relations between Ninus, Semiramis, Sardanapalus, and Sennacherib, with Syria, Asia Minor, and Greece.

In addition to the special works named under the articles BABYLON, NINEVEH, etc., the following should be consulted: BOTTA, *Monuments de Ninive*, etc., fol., Paris, 1848; and *Discouvertes*, etc., translated by Mrs. TOBIN, 8vo., London, 1850; FERGUSSON, *The Palaces of Nineveh and Persepolis Restored*, 8vo., London, 1851; LAYARD, *Monuments of Nineveh*, etc., fol., London, 1849; *Fresh Discoveries*, 8vo., London, 1853; *The Palace of Sennacherib*, fol., London, 1853.

ASTA (ANTONIO DE) was engaged in 1620, with J. B. Semeria and others, on works of the Pantheon of the Escorial, designed by Juan Gomez de Mora. 66.

ASTA or ASTI (the ancient ASTA POMPEIA, HASTA, or HASTA). The chief town of the province of Asti, and the seat of a bishop, in the Sardinian States. It is surrounded by decaying walls, once famous for their hundred towers, of which few remain. It is divided into two districts, the city of palaces, and the town of trade. The cathedral, under the invocation of the Assumption, fell down in 1323; it was rebuilt as it is now seen, being completed about 1348. A fine collegiate church, in a Pointed style, is dedicated to S. Secondo; the church of S. Pietro in Concava was probably an ancient baptistery. There were eight parish churches, of which three are considered fine buildings, but the number is now reduced; three collegiate, and about forty-five other churches; a royal college; a school of jurisprudence; a theological seminary, a rich and picturesque building, designed by Alfieri; and a printing office, open since 1479. The other public buildings are the palace of the intendent of the province, the palace of justice, and other offices; and an hospital. The chief private edifices are the palazzi Alfieri, Bristagni, Massetti, Rovero, and Trinco. DALY, *Revue Générale*, iv. W. H.

ASTEL. A board or plank used for protection overhead in tunneling; the word is also used for an arched or flat ceiling of such boards or planks. 23.

ASTIAN (ANDRES DE) was engaged in 1593, with Bartolomé de Elorriaga, upon the parish church of Sta. Quiteria, in the town of Alcazar de S. Juan, in the province of La Mancha in Spain. 66.

ASTON or ASHTON (RICHARD), abbot of Peterborough, commenced, about the year 1440, the buildings called the chapels, at the east end of the conventual church. BRITTON, *Hist., etc., Peterborough Cath.*, fol., London, 1828.

ASTORGA (the ancient AUGUSTA ASTURICA). The principal town of the province of South Leon in Spain. This city, the seat of a bishopric, is remarkable for its walls with numerous semicircular towers, which, as at Coria and Lugo, recall the appearance of an ancient Roman fortified city. The cathedral, under the invocation of the Assumption, was begun to be rebuilt for the third time in 1471, Juan de Albear who died in 1592, was *maestro mayor* of the works, but it was not until 1704 that the second tower was finished; one of the towers is of a red stone, with a slated top, the other, which is of a grey stone, lost its top in the earthquake of 1765. The building is 194 feet 7 inches long and 77 feet wide: the *altar mayor*, finished in 1569, is by Gaspar Becerra. This retablo is the most remarkable of its kind in Spain, not excepting that at Medina del Rio Seco: the stalls in the choir and the stained glass in the windows date from 1551; the screen (*verja*) from 1622. The cloister by Gaspar Lopez, at some time architect of the cathedral, merits particular attention, as well as the fine pavement of the sacristy, which was finished in 1772. Eight churches, four of them belonging to the eleventh century; the episcopal palace; the fine *seminario consiliar*; the town hall; the remains of the Osorio palace, two hospitals, and an asylum, are the only other objects of attention, except a celebrated alameda, finished in 1840. W. H.

ASTRAGAL (Gr. ἀστράγαλος). A convex molding, the section of which may be nearly an entire circle. The term is applied by VITRUVIUS, iii, 3, to two repetitions of a semicircular profile between the scotias in the base of his Ionic order; and it is of course applicable to such a molding in any design for a base. The moderns have also followed VITRUVIUS, iii, 3, iv, 1, in giving this name to a like molding at the top of the shaft of a column, and it is also used for the somewhat similar molding connected with the fascias of architraves, and employed in a few other positions. When cut into a BEAD AND REEL, it is common to both Greek and Roman architecture (ASTRAGALUM LESBIUM); but there are examples of its being carved to represent leaves, as in the arch of the Goldsmiths, and reeds bound together, as on the base of the pedestal of the column to Trajan, at Rome.

QUATREMÈRE DE QUINCY, *Dict. s. v.*, observes that the astragal was considered, according to VITRUVIUS, as a part of the shaft, but that several modern authors have asserted that it should belong to the Ionic capital, because it is frequently decorated with carving: and he very justly shows that the astragal neither is, nor necessarily should be, always carved; and that if due regard be paid to propriety and appearance in construction, the astragal, or at least a fillet accompanying it, must be left to the column, or be made of the same material or colour, for the scape of the column cannot safely be finished with the arris of the hollow and without the fillet: yet in the monument of Lysicrates at Athens, it has been supposed that a metal band was placed in the sinking between the top of the shaft and the lower part of the capital, while a sinking seems to have been cut under the astragal at the top of the columns in the temple to Jupiter Olympius. BAGUETTE.

Astragal and fillet, A; astragal and hollow, B; astragal and quarter round, C; astragal and ogce, D; astragal and cyma reversa, E; astragal and ovolo, F; these are various sections of bars for window-sashes, rails and stiles for delicate panelling, and other similar works in joinery, cabinet-making and metal work.

ASTRAGALUM LESBIUM. A term used for a molding by VITRUVIUS, iv, 6, which has not been satisfactorily explained by any of his commentators: it has been variously stated to be an ovolo, a cavetto, and a talon; but professional com-



mentators seem to have decided that VITRUVIUS meant by it a BEAD AND REEL.

ASTRAKAN, ASTORAKAN, or ASTRAKHAN. The chief city of a government in Asiatic Russia. It is situated on the island Dolgoi in the river Volga, is divided into the old and the white towns, and has been built chiefly from the ruins of Adshotarkan and other neighbouring cities; most of the principal buildings are of sandstone; but the private dwellings are chiefly constructed of timber. Viewed from a distance, the effect of the town is picturesque, and the same effect is produced on entering it by the wide streets with canals bordered by trees. The cathedral, commenced in 1698 and finished about 1704, is a large square building, the front being about 163 feet wide and 117 feet deep, having four small painted and gilt cupolas on the roof, from which a large central one rises and admits light. The font is a silver urn weighing 94 lbs. There are thirty-one stone or brick plastered, and three wooden, churches or chapels for various religious denominations, of which those of the Jesuits and the Greek Armenians are most praised; of the nineteen mosques, one erected during the present century resembles the Greek churches. The *kremlin* or fort contains, besides the cathedral and barracks, an interesting architectural curiosity in a small disused Moorsque looking church. The other public buildings are the archbishop's palace; the government offices; a theological seminary; a gymnasium, or rather marine school, and six other public schools; a library; two printing offices; and three FACTORY HALLS, or rather bazaars, for the Russian, Persian, and Tartar merchants respectively, which comprise some tasteful buildings, particularly the Persian street, which has an arcade on each side supported by pillars. The city, once fortified by the Tartars or other orientals, now retains only some old embattled towers and portions of the walls. W. H.

ASTROCARYUM VULGARE. A native palm (*tucium*) of the dry forest lands on the borders of the rivers Amazon and Rio Negro in South America. It forms a lofty tree, the stem growing to a height of 40 or 50 feet, with a diameter of 6 or 8 inches. The unopened leaves are used to manufacture small cordage, bowstrings, etc., and are superior in fineness, strength, and durability, to that procured from the MAURITIA flexuosa. WALLACE, *Palms*, etc., 12mo., London, 1853.

A. aculeatum, a palm of Trinidad, the wood (*gri gri*) affording excellent veneers for ornamental purposes. 71.

ASTRONOMICAL BUILDING, see OBSERVATORY.

ASTRONOMICAL COLUMN. An observatory built in the form of a column, containing winding stairs which give access to an instrument placed at the summit for astronomical observations: such was the column of the Doric order built at the old Hôtel de Soissons, and now attached to the Halle-au-Blé in Paris, at the desire of Catherine de Medicis, as a convenient study for her astrologer.

ASTYLAR (from the Greek privative *a* and *στέλος* a column). A term of modern invention, denoting that a design has no principal order or orders of columns or pilasters, however decorated it may be in other respects; such an edifice is not only susceptible of a high degree of embellishment, but can have a cornice advantageously proportioned to the entire elevation. 14.

ASTYLLEN. A small ward or stoppage, a species of dam, put in an adit or tunnel to prevent free or full passage of water. 23.

ASTYNOMOS (Gr. ἀστυνομός). The title given to a public officer or officers appointed in most Greek cities to preserve order in the streets, to superintend the scavengers, and to see that all buildings, both public and private, were safe and not likely to cause injury or damage by falling down. 78.

ASULA, see ASSULA.

ASYLUM. Formerly this term meant a place of safety, where it was not permitted to offer violence to, or even to touch slaves, debtors, or criminals, except night and highway robbers and persons who had committed enormous crimes in a church upon presumption of its protection, for the interior of the

temple, and especially the altar, was the sanctuary for the refugee: but at a very early period this privilege included all the space within the walls of the churchyard, sometimes called sanctuary, and was even extended to graves, towers, monasteries, schools, etc. The present signification of the word in Great Britain is a refuge for the distressed in mind, body, or estate, especially orphans, lunatics, the deaf and dumb, the blind, and in some cases the aged poor. The general arrangements required in such buildings will be found under the separate heads, of ALMSHOUSE, HOSPITAL, LUNATIC ASYLUM, etc. W. H.

Perhaps no hospitals in Europe are so magnificently accommodated or so liberally endowed as that of Santo Spirito, founded in 1198, on the right bank of the Tiber at Rome: it contains, besides the hospital for the sick of all classes, a founding hospital or asylum receiving annually about 800 children, and a lunatic asylum with 400 patients. The lunatic asylums of Palermo and Perugia should also be mentioned.

ASYMMETRICAL. An adjective which has been lately revived, and is used to express that anything is wanting in symmetry. 4.

ASYN KALE. A town in the paschalic of Anatolia in Asiatic Turkey, see IASSUS or IASUS.

ATACAMITE, or ATTACAMITE (Fr. *cuivre muriaté*). The native muriate of copper of commerce, otherwise the prismatic green malachite used as a pigment for various shades of green. W. H.

ATARACEA. The Spanish term for inlaid wood-work of various colours (INTARSIATURA), as well as for anything composed of several pieces. 66.

ATARAZANA or TARAZANA. A term explained by Spanish writers as being derived from the Arabic *atar-azana*, signifying a work-shop: hence the Italian *darsena* and the English ARSENAL. 66.

ATAURIQUE. The Spanish term for a sort of work in plaster, with which the Moors ornamented their edifices. 66.

ATAUXIAS. The term used by Spanish authors for Damascusene work in ceilings. 66.

ATCHEEN or ACHEEN, popularly ACHEM. The capital of the kingdom of the same name in the island of Sumatra. The city contains a greater number of mosques and other public buildings than is usually seen in towns of similar magnitude in the Malayan peninsula. The streets are wide, and have rows of trees on each side. The houses are built of bamboo, and are raised upon piles some feet above the ground, in order to place them out of reach of inundation. The finest buildings are the palace, some of the mosques, and the hospitals. W. H.

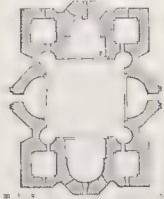
MARSDEN, *History of Sumatra*, fol., Lond., 1811; FORREST, *Voyage to the Mergui Archipelago*, 4to., Lond., 1792.

ATECHIEGAH, see PYREUM.

ATENA (the ancient Atina). A town of the province of Principato Citra, in the kingdom of Naples. It is remarkable for extensive remains of antique walls, towers, and of an amphitheatre. ROMANELLI, *Antica Topografia*, vol. i, p. 424, 4to., Naples, 1815.

ATENI, a village in Georgia, contains a church of Armenian architecture apparently copied from that at Sion hereafter mentioned, and two others in a Greco- or Byzantino-Georgian style; there are five other churches within as many miles: all of which, however curious and deserving of study, are less remarkable than the celebrated monastery of Sion, situated one mile from Ateni and at an elevation of three hundred feet above the river Tana. The church of the monastery is the cathedral of a bishop: it was built by an architect named Boghos, by order of a Georgian prince, Bagrat II, a little before the year 998, in a style strictly Armenian (*i.e.* previous to the development of a Georgian style), and on a

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plan apparently copied from that of the church of Sta. Ripsime, near Eshmiadzin (VAGARCHABAD). The top of the dome, shown in the centre of the accompanying illustration, given by DUBOIS, *Voyage*, is 68 feet from the pavement; the exterior, of a simple character, is finished in ashlar masonry of a greenish sandstone (*grès vert*).

ATHELSTAN, or ÆTHELSTAN, see HEREFORD (ÆTHELSTAN OF).

ATHENÆUM (Gr. *ἀθηναιον*; It. *ateneo*; Fr. *athénée*). The name sometimes given to buildings devoted to literature or the arts, derived from Athenæ, Minerva, the goddess of wisdom and learning. Hence a building on the Capitoline Hill at Rome was so called as it contained a school founded by the Emperor Hadrian, A.D. 135, for the promotion of the liberal arts. This institution seems to have been a *college*, in the English acceptance of the word (equivalent to a *university* of the continental system), in which lectures were given by orators, grammarians, sophists, philosophers, and lawyers, to students from metropolitan and provincial high schools. AURELIUS VICTOR, *Cæs.* 14; DION CASSIUS, lxxiii, 17. Orators, poets, and critics, who had previously been obliged to a wealthy patron for the loan of a large room, fitted, however, with seats and other conveniences by themselves, were allowed to recite their compositions, sometimes before an imperial audience, in the theatres of this and subsequent establishments. The name was also given to another building belonging to a similar and almost equally celebrated institution, founded by Caligula at Lyons in France, which still gives its name to a literary society in that city. The modern use, however, of this term in France, for an educational establishment and its buildings, agrees more nearly with the original acceptance than its application at present in England, where it is adopted by associations either because they chiefly consist of literary men, or can point to some connexion with literature, even if only as subscription libraries, with or without lecture and reading rooms. The coffee-room and library, called the Athenæum, at Liverpool, designed by Foster, is given by RICHARDSON, *New Vitruvius Britannicus*, ii, pl. 44-49, fol., Lond., 1802, and a similar establishment, with the same title, designed by Mr. R. Wallace, at Derby, is illustrated and explained in the *Civil Engineer*, etc., Journal, ii, 31. LYCEUM. SCHOLA.

ATHENÆUS and CLEODAMUS, were architects of Byzantium, employed by the emperor Gallienus (A.D. 254-268) to restore the cities destroyed by the Scythæ and other invaders. TREBELLIVS POLLIO, in *Vita Gall.*

ATHENAON. The ancient name of SOUDAK in the Crimea.

ATHENS (Gr. *Ἀθῆναι*; It. *Atene*; Fr. *Athènes*; Ger. *Athen*; corrupted into *Setines*). The celebrated capital of ancient Attica, one of the seven districts or states of Græcia Propria. The history of Athens is carried back to a very remote period, and there is reason to believe that Cecrops, an Egyptian, who introduced from Sais the worship of Neith (by the Athenians called *Ἀθηνῶν*), was contemporary with Moses. The rock of the Acropolis, rising abruptly from an extensive plain at a distance of four miles from the sea coast, contained at that early period all the habitations of the Athenians, and received from Cecrops the name of Cecropia which was afterwards changed to that designation which it has ever since retained.

From the time of Cecrops, B.C. 1556, (?) a monarchical form of government prevailed during four hundred and fifty years, and to this succeeded a democracy under chiefs or archons. Theseus, B.C. 1300, having concentrated the government of the twelve cities of Attica in Athens, the increase of population occasioned the extension of the buildings on all sides at the foot of the rock, which became the citadel. Under the usurpation of the enlightened Peisistratus and his sons, B.C. 566-514, the city improved rapidly in splendour and civilization, and excited the envy and cupidity of Xerxes, by whom it was reduced to ashes during the Persian war, B.C. 490. It was restored under the administration of Themistocles, who built the walls,

and many buildings of public utility. Cimon displayed his views of magnificence in erecting the temple of Theseus, the pæcile stoa, *a*, the Dionysiac theatre, *b*, the south wall of the Acropolis, and the long walls connecting the city with the harbours, the cost of which was defrayed with the spoils taken from the Persians; while the stoa, gymnasia, and the embellishments of the academy and agora, were carried out principally at his own expense.

It was, however, under the administration of Pericles, *b.c.* 460-429, that the city reached its greatest degree of splendour and wealth. In addition to the Persian spoils above named, Pericles availed himself of the contributions placed by the tributary states in the temple of Delos; besides completing the fortifications and other erections already commenced, he built the Erechtheum, the Parthenon, and the Propylea at Athens; the temple at Eleusis, and restored numerous buildings injured by the Persians in various parts of Attica. The finest buildings of this period were erected within the space of the fifty years intervening between the battle of Salamis and the commencement of the Peloponnesian war.

At this time Athens consisted of three divisions contained within one line of fortifications, the Acropolis, the Asty or town, and the maritime town and ports called PIRÆUS, MUNYCHIA, and PHALERUM, which together formed a continued town more extensive than the two other divisions. The entire circuit of the walls was 175 stadia (22 miles), of which the city walls measured 43 stadia, the long walls 75 stadia, and the walls of the maritime port town 57 stadia. Two parallel long walls, each about 4 miles in length, and about 550 feet apart, connected the city with the ports and arsenals of Piræus and Munychia, while a third wall communicated with those of Phalerum. According to Xenophon, the population of the city amounted to 120,000 inhabitants of all classes. Notwithstanding the size and magnificence of the capital, the extent of the state of Attica did not equal that of the county of York; its surprising prosperity is therefore to be attributed to its naval and commercial supremacy, and to its pre-eminence in arts and civilization.

Athens was captured *b.c.* 404 by the Lacedæmonians, during the Peloponnesian war, when the long walls were injured; but they were restored by Conon, *b.c.* 393. After this period the city fell under the dominion of the Thirty Tyrants. It opposed the progress of Philip of Macedon, *b.c.* 200; but subsequently (*b.c.* 86) yielded to the Roman arms under Sylla, who levelled the long walls, and destroyed or carried away many of the finest monuments to adorn the capital of the Roman empire. The Roman emperors favoured the city, and treated it with respect and indulgence; indeed, no other city ever enjoyed such continued prosperity so long after the loss of its political importance; the most remarkable buildings erected in it after the decline of her naval power having been executed at the expense of foreign potentates. Julius Cæsar and Augustus assisted to erect the propylum of the new agora; Ptolemy Philadelphus built a magnificent gymnasium near the temple of Theseus; Attalus, king of Pergamus, made presents to the Acropolis; Antiochus Epiphanes continued the works of the temple of Jupiter Olympius begun by Peisistratus; they were resumed by Augustus and the states in alliance with him, and completed by Hadrian. Ariobarzanes, king of Cappadocia, repaired the odeum of Pericles, which had been injured during the siege by Sylla. Hadrian finished the temple of Jupiter Olympius, erected two other temples, a stoa, a library, a gymnasium, and gave his name to a new quarter on the south-east side of the city. Several opulent individuals, native and foreign, emulated these regal examples. Andronicus Cyrrhestes built the horologium in the agora; Agrippa a theatre; and Herodes Atticus covered the seats of the stadium with marble, and also built a theatre, the ruins of which still remain. In the time of the Antonines, *A.D.* 138-180, Athens still exhibited the accumulated magnificence of eight or ten centuries, and was treated with due respect during the Roman wars; and though Caligula and Nero are

recorded to have plundered Greece of its productions of art, still no statues were taken from Athens, but it is probable Nero removed all the pictures, as only mural paintings are described by PAUSANIAS, who afterwards visited the city.

The early Byzantine emperors extended their favour to the city, the buildings of which do not appear to have been injured before the incursions of the Goths under Alaric, *A.D.* 396, who, though a recent and zealous convert to Christianity, treated the city with the greatest lenity. At the time when Theodosius the younger, *A.D.* 420, is supposed to have effected the complete abolition of Paganism at Athens and in the surrounding parts of Greece, the Parthenon and the temple of Theseus, having from their solidity and excellent construction withstood the effect of time, were converted, with all their external decorations uninjured, into Christian churches. Under the emperor Justinian, the walls of the city were restored; but of the remaining buildings of antiquity, those susceptible of repair were converted into churches, while many that were in a state of dilapidation were entirely demolished for the sake of the materials, and used to construct new buildings in other parts of the empire.

During the middle ages Athens sank into insignificance. After the conquest of Constantinople by the Latins, 1204, it became a principality or dukedom under Frank domination, and continued so until it was taken by the Turks in 1456, when the Parthenon was transformed into a mosque. In 1636 the east portico of the Propylæum, with the magazine within it, was struck by lightning. The Venetians surprised and plundered the city in 1464; and besieged it in 1687, when the buildings and sculptures on the Acropolis suffered considerably from wilful injury, and the Parthenon was irreparably damaged by the explosion of the magazine which it contained. A threatened descent by the Albanians, 1770, occasioned the modern walls of the town to be hastily constructed, when many remains of ancient edifices were destroyed, or built into the works. The Acropolis, as well as the town, again suffered from the attacks of the contending parties during the war of Independence, 1821-1827; and a learned traveller, who visited the city in 1832, mentions that "there was scarcely any building at Athens in so perfect a state as the temple of Theseus, and that the least ruined objects were some of the (ancient) ruins themselves." WORDSWORTH, *Attica*.

The degree of excellence in the arts which Athens attained, is proved no less by the concurring testimonies of ancient writers, than by the spectacle which it presents even at this present time. Barbarians have laid waste the country and destroyed the temples; the violence of the Goths, the predatory incursions of the Romans, and the ignorance of the Mahomedan conquerors, have in their turn contributed to the downfall of Athens; debased till lately below the common level of conquered states, she is still, however, mistress of treasures, the envy and admiration of the world, as the efforts of the Venetians and French, and the later exertions of the English, to enrich their several countries with her spoils sufficiently attest.

As early as the fifteenth and sixteenth centuries, the attention of travellers and students had been drawn to the buildings at Athens. In 1674 Jacques Carrey, an artist who accompanied the Marquis de Nointel, French ambassador to the Porte, made drawings of the sculptures of the Parthenon and of other buildings. In 1676, Mr. Vernon, Dr. Spon, and Sir G. Wheeler visited the ruins; in 1751, Messrs. Stuart and Revett proceeded from Rome to Athens, and spent three years in preparing the materials for their well known publication; in 1764, Messrs. Revett, Chandler, and Pars visited this city, at the instance of the Dilettanti Society. The publication of the works by the above artists has mainly conducted to draw the attention of the civilized world to these mutilated and time-worn relics.

The buildings found scattered over the tract formerly occupied by the city of Athens, with those on the Acropolis, which are collectively the subject of the following remarks, constitute the principal remains now existing of this once populous and

crowded city. A list of publications essential to a perfect appreciation of the architectural merits of this city, is given at the end of this notice.

MINOR REMAINS.

To the west of the Acropolis is the Areiopagus, A, a place of meeting for a judicial assembly, formed on an eminence cut into level floors and steps. South of it are traces of the Pnyx, B, the place for public meetings in the more ancient period of the State; the area for the auditory was supported by a wall of very massive masonry of Pelasgic character; the bema, *b*, where the orator stood, is distinctly marked. On an eminence south-west of the Acropolis, and just within the city walls, is the monument of Philopappus, *d*, erected about A.D. 100, consisting of a façade 32 feet high, curved in plan: it is ornamented with bas reliefs and statues well executed in white marble. Close under the Acropolis is the odeum of Regilla, *c*, a theatre of the Roman period, built of brick and stone, and still tolerably perfect. Further to the east may be found the outline of part of the Dionysiac theatre, *n*, once an important building capable of containing 30,000 people; it was commenced 475 B.C.: between these two theatres is the choragic monument of Thrasylus, a façade formerly 30 feet high of two pilasters and a central pier, forming the entrance to a large cave; it is in a great measure perished; the statue which existed on the summit is now in the British Museum. Near this monument are two columns with triangular capitals for the reception of trophies gained in dramatic contest. More eastward is the choragic monument of Lysicrates, *r*, considered the most ancient example of the Corinthian order; the general form is preserved, but the minute ornamentation is sadly mutilated.



A gateway, *v*, called the arch of Hadrian, adjoins the peribolus of the temple of Jupiter Olympius, *g*; it was founded by Peisistratus, and continued under later reigns, portions of the enclosures remain at the south-east angle; in this part also is the chief group of the fifteen columns which remain of this stupendous temple. The total length was 354 feet long, by 171 feet in width; the arrangement was decastyle with a dipteral peristyle, and the total number of the white marble Corinthian columns is supposed to have been 124: their diameter is 6.31 feet, and height 55.225 feet, or $8\frac{1}{4}$ diam.; the entasis is .118 foot in a length of 43.70 feet, or $\frac{1}{360}$; their axis is perpendicular. A certain crispness in the outline of the foliage, and the pointed angle of the abacus, distinguish the capital from the later or Roman form; some huge blocks of the architrave, which has three fascias, still remain in their place. Outside the city to the east, is the Panathenaic stadium, *h*, formed in a natural hollow; the general outline alone exists; it was formerly approached by a bridge over the river Ilissus, now destroyed.

In the busiest part of the modern city, situated north of the Acropolis, is the stoa of Hadrian, *i*, built about A.D. 125; the ancient enclosure remains on two sides of the quadrangle, it measures about 400 feet long by 300 feet wide. On the south side part of a tetrastyle portico of the Corinthian order remains, on each side is a colonnade raised on pedestals supporting a broken entablature; the columns are 28 feet in height and of single blocks of Cipollino marble: the style of architecture is far from pure.

Near this is a specimen of the Doric order of the remarkably late date of B.C. 20, named from an inscription on it, the gate of the New Agora, *k*; four columns remain, having a ditriglyph intercolumniation in the centre, with a pediment over; their diameter is 4.3 feet, the height 26.2 feet, or upwards of six diameters. Still nearer to the Acropolis, on high ground, stands the octagonal building called the Horologium, and commonly termed the Tower of the Winds, *l*, specially described by VITRUVIUS, *i*, 6; on the floor some traces of a clepsidra may

be observed; two small porches, the columns of which, restored from the fragments around, exhibit a variation of the Corinthian capital, gave access to the interior, which is without light. The external width is 25 feet, the height about 47 feet: it was built by Andronicus Cyrrhestes, nearly a century B.C.

On the extreme western side of the city, and well raised above the plain, is the temple of Theseus, *m*, commenced A.C. 466, it is as remarkable for its beauty as for its rare state of preservation. The plan is hexastyle peripteral, having thirteen columns in the flanks; the cella is undivided, the pronaos and posticum are distyle *in antis*; the columns of the former alone are wanting of the total number, thirty-eight. In consequence of the fall of the ground on the north side, there is a basement wall about 4 feet high. There are only two steps, the upper one measures 45.011 feet by 104.23 feet; the columns are 3.3 in diameter, 18.75 high, or five times the breadth of the abacus, 3.75 feet, which again is $\frac{1}{3}$ of the entire width; the entasis of the columns is .023 foot in 17.1 feet, or $\frac{1}{750}$ of that quantity; the inclination of the axis $\frac{1}{100}$ of their height; that of the entablature $\frac{1}{120}$. From Mr. Penrose's investigations it is ascertained that the horizontal lines of the steps and epistylia have a slight curvature upwards, amounting to .065 foot or $\frac{1}{200}$ of the length or chord line in the fronts, and .105 feet or $\frac{1}{100}$ in the flanks. The construction and various peculiarities of this building are analogous with those of the Parthenon; but a slight curvature in the line of the pediments is observable which is not found elsewhere. Traces and fragments of colour, chiefly strong blue and red, are now to be found only in the soffits and less exposed parts. The sculpture, which adorned this temple, though not profuse, has been of importance; in addition to the metopes and the friezes at the east end and its returns, the tympana of the pediments at both ends appear to have been enriched with groups, the sculpture of which does not remain.

Nearer the city is a fragment of fine marble masonry, probably the remains of the gymnasium of Ptolemy, *n*; some large hermae entwined with serpents are in the vicinity.

The cave of Apollo and Pan, *e*, lays at the base of the north-west angle; it measures about 18 ft. in length, 30 feet in height, and 15 feet in depth; there are two excavated ledges cut in the rock, perhaps for the statues of the two deities, and also numerous niches and holes for the reception of votive offerings. A statue of Pan, now in the public library of Cambridge, was discovered in a garden a little below the cave.

The flight of forty-seven steps also shown in the medal, is that leading to the fountain called Clepsidra. This and the preceding medal are engraved in accordance with Mr. Donaldson's drawings from the medals in the British Museum. They are about double the size of the originals.

THE ACROPOLIS.

The general figure of the Acropolis is of an irregular oval, measuring about 1000 feet from east to west, and 500 feet from north to south; it is elevated about 250 feet above the city. It is lowest at the western extremity, and here the contour of the surrounding ground also points out the easiest approach. In consequence of numerous sieges, the masonry of the Pelasgi, the first inhabitants of this rock, is nowhere visible in the external walls, the most ancient part of them being probably the work of Themistocles, and the large wall on the south side the work of Cimon. A part of the wall on the north side of the Acropolis includes the drums of marble columns six feet in diameter; and at a short distance from them is a complete Doric entablature of limestone, built into the masonry: these are identified as remains of the earlier Parthenon, a hexastyle temple, destroyed by the Persian invaders, B.C. 480, when the materials as related by THUCYDIDES, were used by the advice of Themistocles in repairing the then defenceless fortress.



For a long period, the entrance has been on the south side of the west outworks, *l* (on small illustration below); some recent excavations, made by M. Boulé in 1852 (*REVUE ARCHÉOLOGIQUE*, Mai 1853) have laid open an ancient gateway, *m*. It is placed in a wall of moderate thickness, between two flanking walls, and is about 6 feet wide and 12 feet high; above the opening is a Doric entablature. Within the gateway, a steep ascent between two flights of steps leads directly to the Propylæa, their united width being about 71 feet.



Plan of the ancient city of Athens, showing the position of the buildings described herein.
h, Boundary of the city before the Persians War.
l, Situation of the remains of the Aqueeduct of Hadrian.

On the south side of the new entrance is a massive basement supporting the temple of Nike-Apteros or Victory without wings, *f*, erected about the time of Cimon; its plan is amphiprostyle, 27 feet long by 18 feet wide, having four Ionic columns 13.5 feet high at either end; the frieze is sculptured, part of it is now in the British Museum. A parapet covered with sculpture of great beauty protected the platform on which the temple stood. A careful description is given by HANSEN, SCHAUERT, and ROSS, *Acropolis von Athen*, fol., Berlin, 1839. On the north side of the ascent is a tall pedestal of later times, which is supposed to have supported two equestrian figures. A band of black marble separates the stylobate of the Propylæa from the grand flight below, while the chariot road continues its ascent through them.

The plan of the Propylæa, *o*, consists of two similar hexastyle porticos, with a central ditriglyph intercolumniation, one facing eastward to the Acropolis, the other westward to the ascent; high walls on each side extend about 50 feet, occupying the whole width of the rock: two wings projecting about 50 feet, and 40 feet in depth, stand on each side of the entrance. The wings have porticos facing each other of three columns *in antis*: the columns are 3.516 feet in diameter, and 19.225 feet in height: an apartment, *A*, described as a pinacotheca by PAUSANIAS, occupies the northern one; the plan of the south side is not so clear, and seems never to have been completed: they were lately supposed to have been covered with pyramidal or hipped roofs, the tiles, as in all buildings of the period, being of marble.

The west portico, which is 60 feet wide within the walls, and 50 feet deep, was covered by a marble ceiling supported on six Ionic columns; an ascent of five steps then leads to the level of the east portico, which is 24 feet deep. On the top of these steps are five gates or doors, the large central one of which was intended solely for the admission of the quadrennial or Panathenaic procession. The columns of the larger order are 5.11 feet in diameter, with twenty flutes, and 29.1 feet high (28.13 in east portico); their axes incline backward $\frac{1}{10}$ of their height, the entasis is $\frac{1}{100}$ of the length of shaft, the walls, architrave, and frieze, have also an inclination, so that all the vertical lines have a

slight pyramidal tendency: the face of the anta next its neighbouring column inclines towards it $\frac{1}{100}$ of its height; a horizontal curvature of .119 feet in 68.1 feet is found in the epistylia. In the smaller order, which is to the larger in the proportion of 7 to 10, the same principles are observed throughout. The Ionic columns within the west portico are of remarkable elegance; their diameter is 3.4 feet, the height of the column close upon 34 feet; the base has two tori with the circular plinth described by VITRUVIUS, iv, 7. The outline of the capital is of great beauty, and exhibits traces of colour; these evidences indeed, consisting of incised lines and pieces of thick pigment, blue, red, and green, are found in various parts of the soffit of the external cornice, the capitals of the antæ, and the coffers and ovolo moldings of the ceilings; these surfaces, with the exception of the mutules, are all small, and judging from the examples of the Periclean buildings, it appears impossible to

prove that the larger surfaces of architraves, capitals, columns, or walls, were coated with any pigment. The incised ornaments on moldings and coffers are invariably very small in scale compared with the whole: it may be here remarked that with the exception of a small bead sparingly used in the Parthenon, and of the ovolo of the antæ capitals, there is no carved molding throughout the whole of the Doric architecture of Athens. Of sculpture none is found in the Propylæa forming

part of the design, but it appears that many statues anciently adorned it as accessories. The present ruined state of the whole is owing to its position, which necessarily made it a fortress from the middle ages till the time of the war of Liberation, during the progress of which both the Propylæa and the west portico of the Parthenon suffered deplorably. The vast quantity of fragments remaining, however, afford data for an imaginary restoration. The architect Mnesicles began this building by order of Pericles, B.C. 437, and it only occupied five years in building. LEAKE and others estimate the stated cost to be equal to £480,000 of present money.

Having passed through the Propylæa, the most perfect view of the Parthenon is obtained, its distance, angle of perspective, and elevation above the eye, being all probably designed for this end by the ancient artists; the statue of Minerva Promachus, *p*, was directly in front, the plinth of its pedestal is yet to be seen. The axes of the Parthenon and Propylæa stand parallel; the other monuments on the Acropolis stand at various angles with them; in the same way the Gate of Hadrian is not parallel with the Olympeum, but at an angle affording the spectator a pleasing view. The surface of the rock in most parts is cut and levelled into platforms and terraces; a road may be traced some distance from the Propylæa, the steep ascent being made practicable by cross grooves; the whole rise is about 40 feet.

THE PARTHENON, TEMPLE OF MINERVA, TEMPLE OF THE VIRGIN, OR THE HECATOMPEDON.

The Parthenon, *q*, occupies the highest site of the ground, which slopes rapidly to the south, and on this side is a basement of finely wrought limestone; this is proved to have been constructed for the older Parthenon, and subsequently enlarged; it is remarkable that its horizontal lines are curved similarly to those of the temples. The plan of this temple is an example of the rare arrangement octastyle peripteral, the sides have seventeen columns. Three steps form a stylobate, 5.321 feet in height; the upper step is 100 Attic feet or 101.336 English feet from north to south, and 228.15 feet from east to west, a proportion of 4 to 9 being exactly observed. In the elevation of the building, other simple and striking proportions are found. The height to the apex of the pediment, 59.27 feet, is to the length of the upper step as 7 to 12; the height of the columns, 34.484 feet, again, bears the same ratio to the above dimension: the abacus is one-fifteenth of the length of the upper



Plan of the Propylæa, etc. *h*, Temple (Nike-Apteros); *c*, Pedestal of statue of Minerva; *d*, Column of Peloponnesian walling; *e*, Column of Peloponnesian walling; *f*, Column of Peloponnesian walling; *g*, Column of Peloponnesian walling; *h*, Column of Peloponnesian walling; *i*, Column of Peloponnesian walling; *j*, Column of Peloponnesian walling; *k*, Column of Peloponnesian walling; *l*, Column of Peloponnesian walling; *m*, Column of Peloponnesian walling; *n*, Column of Peloponnesian walling; *o*, Column of Peloponnesian walling; *p*, Column of Peloponnesian walling; *q*, Column of Peloponnesian walling; *r*, Column of Peloponnesian walling; *s*, Column of Peloponnesian walling; *t*, Column of Peloponnesian walling; *u*, Column of Peloponnesian walling; *v*, Column of Peloponnesian walling; *w*, Column of Peloponnesian walling; *x*, Column of Peloponnesian walling; *y*, Column of Peloponnesian walling; *z*, Column of Peloponnesian walling.

step. The columns are 6.25 feet diameter, and therefore 5 diameters $28\frac{1}{2}$ minutes in height; the entasis is .057, equal to $\frac{1}{17}$ the length of shaft, the inclination of axis, is .238 feet, or $\frac{1}{42}$. The flute, unlike those of the Propylæa which are circular in plan, is slightly elliptical, its proportionate depth increasing upwards. The capital, one of which is in the British Museum, is perhaps the most exquisite feature among the details; the echinus is a hyperbolic curve, the profile of the entablature is not less remarkable for its severe beauty; in the pediment too is found a cornice of peculiar fitness, the soffit of which is another example of the use of the conic section; the cymatium is the only circular curve used throughout this building.

The cella is amphiprostyle, and is divided into two parts; the naos, entered from the east, was the most important; it contained the chryselephantine statue of Minerva by Phidias, the site of which is plainly visible, as are also traces of a railing to protect it. Twenty-three Doric columns 3.65 feet diameter, with sixteen flutes, are so disposed as to form an aisle around three sides of this sanctuary. All the light was obtained from the roof. Separate from the naos, and entered from the west, is the opisthodomos, used as a receptacle for archives and precious effects; its ceiling appears to have been supported by four columns, probably of the Ionic order.

As matters of construction, the abundant use of carefully made iron cramps run with lead is noticeable; they occur in the architrave, frieze, cornice, pediments, and ceilings, receptacles for massive beams, as purlins, are provided in the pediments. In the jointing of each block of marble there is such excessive closeness, that besides much labour, some ingenious method must have been used to attain it: in the columns each drum has a mortice in its upper and lower bed filled up by a cube of hard wood, in which is a hole to receive the half of a circular pin, also of wood; this suggests the idea that the drums, as set, were rubbed against each other, the *ωτα* or ears, always found on the rough cylinders, being used in the process. The construction of the entablature, as measured by Mr. J. J. Scoles, is given in the *BUILDER Journal*, vol. for 1846, p. 127.

The remarkable horizontal upward curvature of the steps and epistylia which was discovered so recently as 1834, by Mr. John Pennethorne, occurs both in the fronts and flanks of the temple; it is so palpable as to be observed by mere inspection in a very foreshortened near view; still its amount is so small, .225 feet in the fronts, that in all ordinary points of view it is imperceptible; its purpose is admitted to be that of correcting the tendency in horizontal lines to appear sunk in the middle.

The inequality of the heights of the lowest drum of the columns, SCAMILLI IMPARES of VITRUVIUS, is therefore owing to the curvature of the pavement, and the inclination of the column; on account of this inequality, the remaining drums having parallel beds, are set out of level, except the one under the capital, which compensates for the irregularity.

The principle, first discovered by Mr. T. L. Donaldson in 1820, of slightly inclining the axes of the columns and all vertical surfaces inwards prevails; the faces of the steps, the walls of the cella, the architrave, frieze, and tympanum, even the antefixe, are all influenced by it, the walls lean centrally. On the contrary, the faces of the beams and the corona of the cornice (VITRUVIUS, vi, 4) overhang a little; the front face of the antæ has the same inclination as that described in the Propylæa; the columns of the pronaos and posticum alone have perpendicular axes. The remarks as to the painted decoration of the Propylæa also apply to the Parthenon; the blue colour of the triglyphs is evident. Some ecclesiastical painting of the Byzantine period has deceived one or two observers.

In addition to the thought displayed in every feature, and the marvellous workmanship which rendered the building as it were one entire mass of polished marble, the sculpture, from its unexampled profusion and style, completed the perfection of this signal instance of architectural art. The eastern and western pediments represented respectively the birth of Minerva,

and the contest of that deity with Neptune for the tutelage of Athens: the metopes, ninety-two in number, contained in high relief, the actions of Minerva, the wars with the Centaurs and Lapithæ, and other subjects: a continuous frieze, 520 feet long, encircled the outside of the cella, its subject is the Panathenæic procession. A few traces of colour have been found on some of these sculptures. It is supposed that ten or fifteen years were occupied in the erection of this temple, which was completed B.C. 438. Ictinus and Callicrates were the architects, and Phidias the sculptor, entrusted by Pericles with its erection, which is estimated by LEAKE to have cost a sum equal to £700,000 of our money.

THE ERECHTHEUM.

The Erechtheum, called also the temple of Athena Polias, *κ*, is situated to the north of the Parthenon, within a few yards of the wall of the Acropolis; it occupies the site of a much earlier sanctuary destroyed by the Persians, and the distinct dedications of its several portions have caused the irregularity which is found in the plan of this unique building. The main body, about 72 feet long and 36 feet wide, has a prostyle portico of six columns at the east end, and at the west four half columns, *in antis*, between which are three windows. On the north side is a flight of steps leading down to the *τεμενος* or sacred enclosure, which contained the dwelling of the *κοραι*, or young maidens who officiated in the mysteries of Erechthonius. At the north-west angle of the temple is a spacious portico, 33 feet wide by 20 feet deep, having four columns in front and two at the sides, which gives access, by a highly enriched door, to the western division of the cella. Opposite to this, on the south side, is a small caryatid portico, or rather enclosure, about 17 feet high, consisting of a podium surmounted by six female figures (*κοραι*) each 7 feet high, which support a flat roof; one of these figures is now in the British Museum. The eastern part of the cella seems undoubtedly to be the temple of Minerva Polias, and was famous for an ancient statue of olive wood; the positions of the Cecropium, Pandroseum, the sacred olive tree, and other objects of ancient reverence, are subjects of much uncertainty and dispute: a fissure in the rock, identified as the salt well of Neptune, is found under the north portico. The order is Ionic, executed in marble with a delicacy, refinement of proportion, and exact finish, worthy of the place. The curvature of the horizontal lines and the inclination of the columns cannot be detected in this building. The east portico, standing on three steps, was probably 30 feet high to the apex; its columns are 2.3 feet diameter: those at the west end are 2.665 diameter and 25 feet high, their diminution is .355 feet, and the entasis $\frac{1}{10}$ of that quantity, or $\frac{1}{100}$ of the length of the shaft. The profiles of the bases and apophye are particularly bold and graceful; there are no plinths. The upper torus of the columns at the north-west angle has a double guilloche, the eyes of which were of coloured glass; the capitals are excessively ornate. Traces of colour are found in the ceilings.

The present state of this building, though deplorably ruinous, is complete enough to supply all the features excepting the internal arrangement: it suffered during the war of Liberation, 1821-1827, and again by a violent storm in 1852. It was probably commenced soon after the completion of the Propylæa, but the then impending war must have interfered with its progress. A minute and valuable survey of its unfinished state made by authority, B.C. 498, is inscribed on a marble slab discovered by CHANDLER; its final completion was probably effected some few years after that date. The *BAUZEITUNG* for 1850. TETAZ, in Nos. 1 and 2 of *REVUE ARCHÉOLOGIQUE* for 1851.

Of the other monuments in this city delineated by STUART, two, namely the Ionic temple, *κ*, on the banks of the Ilissus, and the fragment called the Aqueduct of Hadrian, *γ*, have quite disappeared; on the other hand, the temple of the Wingless Victory in the Acropolis was discovered so lately as 1835, and has since been reinstated. The choragic monument of Lysi-

crates, the tower of the Winds, and the arch of Hadrian, have been copied by STUART at Shugborough in Staffordshire (NEALE, *Seats*, etc., vol. iv); the choragic monument has also been erected of the same size as the original over a well at The Wilderness in Kent, the seat of the Marquis Camden, K.G. (NEALE, vol. ii); it is imitated in the belfry of the chapel of S. Philip in Regent Street, London, and has been reproduced as a model of polychromatic decoration at Berlin. A plaster cast of the same monument is now erected in the Crystal Palace at Sydenham.

MODERN CITY.

Modern Athens has sprung up almost entirely since 1834, when it was declared the capital of the kingdom of Greece. The Turkish houses encumbering the Acropolis have been removed, and precautions taken to preserve the antiquities and all future discoveries; the movable objects being deposited, under the superintendence of M. Pittakys, in the temple of Theseus, and in one or two small modern buildings in the Acropolis. It stands on the north side and at the foot of an elevated rock called the Acropolis, which rises from the middle of a plain, bounded on the north by Mount Parnes, on the north-west and west by Mount Egaleos, and on the east and south by Mount Hymettus. Mount Pentelicus is situated about six miles north east from the city; the coast of the Ægean sea and the bay of Salamis form the south and western boundaries. The small river Cephissus flows through the centre of the plain, among olive woods; and the bed of the torrent Ilyssus, which is generally dry, bounds the east side of the site of Athens.

The ancient churches are constructed in the Byzantine style, of squared limestone masonry mixed with courses of thin bricks; the cruciform plan, with various modifications, is almost universal; the roofs are formed of waggon-headed vaults and cupolas, covered with tiles, timber being little used. Excepting an occasional instance of the pointed arch, the work of the Franks, the semicircle prevails in all these buildings. The interiors, which are dimly lighted by narrow unglazed windows, display much fresco painting, representing sacred subjects and personages, in which the old Byzantine treatment is strictly maintained; mosaics, too, are to be found, especially in the monastic churches. The old metropolitan church differs from the others in being built of white marble; carved fragments (STUART, *Antiq.*) are to be found in the walls, on which account alone this building is interesting. The church of S. Taxiarchos and the above are illustrated in GAILHABAUD, *Monuments*, etc., vol. ii.

Of modern buildings, the chief is the king's palace, erected 1836-1843, from the designs of Gaertner of Munich, in the Greek style. Its plan is a quadrangle, 300 feet by 280 feet, enclosing two courts; the porticos, colonnades, and the dressings of the openings are of marble from Pentelicus, the walls being of limestone stuccoed; the exterior is of the plainest outline; great variety and richness are shown in the polychromy of the interior. The university is a pleasing specimen of the same style, designed by Hansen. A parallelogram of 300 feet by 200 feet, includes a hall, class rooms, lecture theatres, a library containing 80,000 volumes, and other conveniences, besides two open courts and shady ambulacra for the students; the façade is adorned with a marble portico of the Ionic order. This is illustrated in the BAUZEITUNG, volume for 1850. Of the same style is the observatory, a cruciform building surmounted by a cupola. The government offices at present offer no subject worthy of remark. The military hospital is a respectable edifice of some size. A cathedral has been recently completed, the nave and aisles are separated by marble columns; the general plan and effect of the building more resemble a basilica than the local churches. The English church, a Gothic edifice erected in 1840, is also given in the same volume of the BAUZEITUNG. A considerable part of the city is laid out in spacious streets and squares, and some good private houses and hotels have been built; but the Greeks are mostly content with dark, mean buildings, of no elevation. Interment is strictly prohibited within the city.

T. J. W.

LABORDE and PACCARD, *Le Parthénon: Documents pour servir à une restauration*, fol., Paris, 1848; SPON and WHELER, *Travels in Asia Minor*, etc., 8vo., Lyons, 1678; WHELER, *Journey into Greece*, 2nd edit., fol., Lond., 1682; BURROWS, *Hist. and Topog. of Athens*, 8vo., Lond., 1837; SOCIETY OF DILETTANTI, *The Ionian Antiquities*, fol., Lond., 1769 and 1823; LEAKE, *Topography of Athens*, second edition, 8vo., London, 1841; MÜLLER, *Attica and Athens*, translated by LOCKHART, 8vo., Lond., 1842; PITTAKYS, *L'Ancienne Athènes*, etc., 8vo., Athens, 1835; QUATREMÈRE DE QUINCY, *Restitution des deux frontons du Temple de Minerve*, 4to., Paris, 1825, and *Jupiter Olympien*, etc., fol., Paris, 1815; STUART and REVETT, *Antiq. of Athens*, 1762-1816; new edition and supplement by KINNARD, etc., *Inedited Antiq. of Athens*, fol., Lond., 1830; translated with additions by HITTORFF, fol., Paris, 1822; VISCONTI, *Ouvrages de Sculpture du Parthénon*, 8vo., Paris, 1818; WILKINS, *Atheniensia*, etc., 8vo., London, 1816; WORDSWORTH, *Athens and Attica*, etc., 8vo., Lond., 1836, and *Greece, Pictorial*, etc., 8vo., Lond., 1840; CASSAS and BENCE, *Grandes Vues Pitt. de la Grèce*, etc., fol., Paris, 1813; INWOOD, *The Erechtheion*, fol., Lond., 1827, translated by QUAST, fol., Potsdam, 1843; PENROSE, *The Principles of Athenian Architecture*, fol., Lond., 1852; SCHINKEL, *Die entwürfe eines palastes auf der Acropolis*, fol., Berlin, ; BAUZEITUNG, edited by HEIT FORSTER, 4to., Vienna, 1835-53; LE ROY, *Les Ruines les plus beaux Monuments de la Grèce*, fol., Paris, 1758; BEULÉ, *L'Acropole d'Athènes*, fol., Paris, 1853; CHANDLER, *Travels in Asia Minor*, 3rd edition, 4to., Oxford, 1802; BLOUET, *Exped. Scient. de Morée*, fol., Paris, 1839; DODWELL, *Cyclop. Romains*, fol., Lond., 1833; DODWELL, *Classical Tour through Greece*, 4to., Lond., 1819; MUIR, *Journal of a Tour in Greece*, 4to., Lond., 1842; GAILHABAUD, *Ancient and Modern Architecture*, 4to., Paris and Lond., 1849, vols. i and ii, illustrate the chief antique remains and also the cathedral and another modern erection; WILLIAMS, *Travels*, etc., 8vo., Edin., 1820; HUGHES, *Travels*, etc., 8vo., Lond., 1830; SMITH, *Dict. of Ancient Geog.*, 8vo., Lond., 1853; MURRAY, *Handbook of Greece*, 8vo., Lond., 1854. A plan of modern Athens is given in the Maps of the Society for the Diffusion of Useful Knowledge, No. 164; COOKESLEY, *Map of Ancient Athens with Index of Names*, 8vo., Eton, 1852; FORCHHAMMER, *Topographie von Athen*, 8vo., Kiel, 1841, with plans of the ancient and modern city. A critical survey of what has been done for the antiquities, etc., is given by WESTERMAN, in the NEUE JAHRBÜCHER FÜR PHILOLOGIE, etc., vol. xli, pp. 230-248.

ATHEROSPERMA MOSCHATUM, Sassafras wood, a native of Van Dieman's Land, growing to a moderate size in great abundance. The wood is soft, even, and close-grained; well adapted for internal building, flooring boards, cabin fittings, etc.; it is also well adapted for turnery purposes. 71.

ATIL, in Syria, usually written AATYL.

ATINA (the ancient ATINA or ATINUM). A city in the province of Terra di Lavoro in the kingdom of Naples. The see was suppressed about 1200; but the town, besides the interest excited by its cathedral, convent, and hospital, possesses considerable attraction for travellers in the extent and magnitude of the ancient walls, built of well hewn and neatly fitted polygonal stones, and in the ruins of aqueducts on a grand scale, which, with fragments of other fabrics, substructions of temples, and remains of minor objects of antiquity, confirm the accounts of the early importance of this city. CRAVEN, *Excursions*, 8vo., London, 1838; ROMANELLI, *Antica Topografia*, i, 61-65, 4to., Naples, 1815, iii, 361. 23. 50.

ATKINSON (PETER), born at or near Ripon in 1725, was originally brought up as a carpenter, but was afterwards engaged by John Carr, architect of York, as an assistant. His memoranda, commencing from 1785, show him to have been thus employed at Buxton, Chatsworth, Harewood, etc.; on Mr. Carr's retirement, he became resident at York, succeeded to a

portion of his engagements, and carried on the works for the Earl of Harewood, those at York castle, etc. He erected a large mansion for Sir John V. B. Johnstone, at Hackness near Scarborough; also a town house for him in York; and was extensively consulted and employed in Yorkshire and the neighbouring counties. As all work was at that period *measured*, much of his time was occupied in that department only. He died 19 June 1805.

J. B. A.

ATKINSON (PETER), born about 1776, a son of the above, was brought up to the profession of architecture in his father's office, and afterwards became his partner. He was employed by the Duke of Devonshire at Wetherby and Bolton, by the Earls of Harewood and Fitzwilliam on their estates, and by many other noblemen. At York he erected the bridge over the river Ouse, commenced in 1810, the premium being awarded to him by Henry Harrison, architect of Chester, to whom the drawings forwarded in competition were referred for decision on their merits. Mr. Atkinson was surveyor and steward to the corporation of York for many years, during which period he built the house of correction and the city gaol. From 1821 to 1831 he erected, under the Church Commissioners, many churches in Yorkshire, viz. Woodhouse near Leeds; Stanley and Alverthorpe near Wakefield; Scarborough; Newmill near Kirkburton; Birkinshaw, Heckmondwike, and Cleckheaton, near Birstal; Crossland and Linthwaite near Almondbury; Golcar near Huddersfield; and that in Travis Street, Manchester. He resided abroad during the last few years of his life, which terminated in 1842. His two sons, John B. and William, follow the profession in the same city.

J. B. A.

ATKINSON (THOMAS) practised at York at the end of the last century. He was employed at Bishopthorpe, the archiepiscopal palace near York, by archbishop Drummond, who built the stables, coachhouses, entrance gateway, porter's lodge, etc., in 1763-5; the additions to the palace, and the new front in the debased Gothic style prevalent at that period, were completed in 1769. Much of the stone used in building the new front was brought from Cawood castle, formerly the episcopal residence. The parish church was perhaps also from his designs, it having been rebuilt by the same archbishop in 1766. NEALE, *Seats, etc., of England*, etc., 4to., London, 1822, vol. v, series 1.

ATKINSON (THOMAS WILLAW) was resident in London, where he published *Gothic Ornaments selected from the different Cathedrals and Churches in England*, fol., London, 1829, consisting of forty-eight plates, drawn and lithographed by himself and his brother CHARLES. About 1831 he erected the church of S. Nicholas at Lower Tooting, to hold 1083 persons, at an expense of £4,619, according to the published engraving. About the same period he was engaged at Minster, in the Isle of Thanet; and designed Hough Hill Priory, Staley Bridge, Cheshire, for David Cheetham, Esq., 1832; and a crescent for the terrace at Beulah Spa, Norwood, 1836. In 1841 he was erecting some villas in the Italian style in the neighbourhood of Cheadle, and had previously enriched the suburbs of Manchester with some of its best buildings. The church of S. Luke at Cheetham Hill, 1840, and that at Openshaw, 1840, both near that city, were from his designs (CIVIL ENGINEER, etc., *Journal*, vol. iv, p. 78). In 1842 he exhibited drawings of the palace at Moorsheadabad, designed by Major-General MacLeod, a fine model of which is in Hampton Court palace. On leaving Manchester he went to Hamburg, and thence to S. Petersburg, in which city it is presumed that he died.

ATKINSON (WILLIAM) was born at Bishop Auckland near Durham, about 1773, and commenced life as a carpenter. Through the patronage of Dr. Barrington, then bishop of Durham, he became a pupil of James Wyatt; in 1797 he obtained the gold medal of the Royal Academy of London; and in 1805 published *Picturesque Views of Cottages*, 4to., London. Amongst his many pupils were Thomas Allason and Matthew Habershon, both lately deceased; also John Burges Watson,

ARCH. PUB. SOC.

Peter Hubert Desvignes, and Robert R. Banks; the late Thos. Tredgold, C.E., may be considered another, as he was in his office from about the twenty-sixth to the thirty-sixth year of his age.

The following works, amongst others, largely engaged his attention during the early part of the nineteenth century; they are designed chiefly in the Gothic of the period; Scone palace, Perthshire, for the Earl of Mansfield, 1803 to 1806, a building 220 feet long by 130 feet in depth (NEALE, *Seats, etc.*, vol. vi, ser. 1); Mulgrave castle, Yorkshire, for the Earl of Mulgrave, the design for which was exhibited in 1804 (NEALE, vol. ii, ser. 2); Rossie priory, Perthshire, for Lord Kinnaird, 1810 to 1815 (NEALE, vol. ii, ser. 2, wherein he is described as being much employed in that part of North Britain); house and offices at Ditton Park, Buckinghamshire, for Lord Montague, the old mansion having been destroyed by fire 28 April 1812 (NEALE, vol. i, ser. 1, and ACKERMANN, *Repository*, 1823, vol. ii); works for his patron the Bishop of Durham, about the same period; Roseberry, Edinburghshire, for the Earl of Roseberry, 1812 to 1816; Biel, Haddingtonshire, for W. Hamilton Nisbet, Esq., 1814 to 1818; Tullyallan, Clackmannanshire, for Earl Keith, 1817 to 1820; extensive additions to Taymouth castle, Perthshire (the body of the house having been erected by Elliot of Edinburgh, NEALE, vol. vi, ser. 1), also Breadalbane house, Park Lane, London, both for the Marquis of Breadalbane, 1818 to 1824; Panshanger, Hertfordshire, for Earl Cowper, 1819 to 1822; Hylands near Chelmsford, Essex, for Peter Caesar Labouchere, Esq., 1819 to 1825 (NEALE, vol. i, ser. 1); Deepdene near Dorking, Surrey (NEALE, vol. iii, ser. 2), and Picture Galleries (pulled down 1849) in Duchess Street, Portland Place, London, for Thomas Hope, Esq., 1819 to 1826; Garnons, Herefordshire, for Sir John Geers Cotterell, Bart., 1820 to 1823 (NEALE, vol. iv, ser. 2); buildings in the Horticultural Gardens at Chiswick, Middlesex, 1822 and 1823; Abbotsford, Roxburghshire, for Sir Walter Scott, Bart., 1822 and 1823 (NEALE, vol. v, ser. 2); Messrs. Ransom's banking house, Pall Mall East, London; Chequers, Buckinghamshire, for Greenhill Russell, Esq.; and a house in Burlington Gardens, London, for the Hon. Col. Cavendish, all in 1823; house in Park Lane, London, 1824, and Himley or Hempley hall, Staffordshire, both for Lord Dudley and Ward, 1824 to 1827; a large house with a chapel adjoining, near Ealing, for Mr. Willan; Bowhill, Selkirkshire, for the Duke of Buccleuch; Beckett near Farringdon, Berkshire, for Lord Barrington; several churches in Scotland; various alterations to the Tower of London; Woolwich Arsenal; and the Ordnance Office, Pall Mall; he was architect to this last institution from 1st Oct. 1813 to 1st Jan. 1829, when his department was abolished: he particularly excelled in alterations to existing edifices: the Transport Office in Cannon Row, Westminster, now the Board of Control, is sometimes attributed to him, but was designed by the late William Pilkington. He died May 22, 1839, aged 66, at his residence Silvermere near Cobham, Surrey, where he had lived the last eight or ten years of his life; and is buried at Walton-on-Thames, Surrey. He was a most excellent chemist, geologist, and botanist, excelling in the latter science in an extraordinary degree. The well known Roman cement, called from himself ATKINSON'S CEMENT, was introduced by him to the London market.

I. B. W.

ATKINSON'S CEMENT. One of the varieties of the natural cement generally known in this country as ROMAN CEMENT. It is made from the argillo-calcareous nodules found on the coast off Whitby in Yorkshire, on the estate of the Marquis of Normanby, from one of whose titles it is locally called Mulgrave cement, and also Yorkshire cement. The component parts may be roughly stated at about 30 per cent. of clay and 70 per cent. of lime; the colour of the cement, that of a dark Bath stone, is due to the large proportion of this ingredient, and its superiority to some other cements in cementitious power is probably attributable to the same cause. It

had the reputation of being a superior kind of Roman cement, and the best cement for stucco, moldings and ornaments, but if plenty of sand is not used (about three parts to one of cement), it is liable to crack. About the year 1816, the east and west fronts of the church of S. Mary le Bow, in the city of London, were stuccoed with this cement, which appears to have stood very well. It is stated that the house at the north-west corner of Park Street and Mount Street, Hyde Park, London, is built of blocks of this cement.

ATLANTES, ATLANTIDES, or ATLASES (Gr. ἀτλαντες). This word is mentioned by VITRUVIUS, vi, 10, as the Greek equivalent for TELAMONES or male figures serving as pillars in a building, such as those in the temple to Jupiter Olympius at Agrigentum. CARYATIDES.

ATMOSPHERE (from the Greek words ἀτμός, vapour, and σφαῖρα, a globe). The elastic fluid surrounding any planet, and, as regards the earth, necessarily containing, besides atmospheric air, all those substances which are capable of existing in the aeriform state at the medium temperature of the earth, if they are at all disengaged at the surface of our planet. These substances are often not discernible even by the most delicate chemical tests at present employed, but are acknowledged in their effects upon animal life, and the substances and processes employed in building. FOUL AIR.

The chemical influence of the atmosphere depends of course upon its composition, and this is known to vary in a very extraordinary manner in different localities. In its normal state, air is considered to be principally composed of oxygen and nitrogen, in the proportions of 208 of the former to 792 of the latter in bulk; but there are other gases in occasional combination with those above named, such as the carbonic acid, ammoniacal, hydrochloric, nitrous, sulphuric, and sulphuretted hydrogen gases; the proportions of all which vary in every possible manner. In many cases, also, it is found that in the same locality the composition of the air varies with the elevation above the ground. Sulphuric acid gas has been detected in the atmosphere of London; acetate and hydrosulphate of ammonia in that of Paris; whilst hydrochloric acid exists in that of all the sea coasts of the temperate regions of the northern hemisphere.

The mechanical action of the atmosphere depends upon the quantity of rain or moisture it may contain, and the conditions under which they may be supplied; upon the circumstances attending the evaporation of the moisture absorbed by the building materials; and upon the conditions of temperature. The greatest amount of water is in suspension, or falls in the shape of rain, to be absorbed perhaps by porous materials, precisely at the season of the year when a diminished temperature exposes those materials to the attacks of frost. On the other hand, the greatest evaporation takes place at the period when all the ordinary conditions of temperature are such as to act most powerfully in producing or developing the salts, resulting from the action of previously absorbed moisture upon the earthy bases which the building materials may contain. G. R. D.

ATMOSPHERIC AIR. The permanently elastic fluid which constitutes the great body of the atmosphere of the earth. It is 815 times lighter than water, and is composed of oxygen and nitrogen or azote, in the following proportions; viz. of bulk, oxygen 1 and nitrogen 4. With these there is constantly found carbonic acid to the extent of about a thousandth part (some chemists say a fifteen hundredth part) of the weight, and a very little water, which is to some extent present in the driest weather; therefore by measure of weight the statement is generally made as follows: nitrogen 77.50, oxygen 21.0, watery vapour (oxygen and hydrogen) 1.42, and carbonic acid (oxygen and carbon) 0.08=100, with a trace of ammonia (nitrogen and hydrogen). It must be observed as an almost universally adopted opinion, that these gases are not chemically mixed, and exercise no influence upon each other except communication of temperature. The mean pressure of

the atmosphere is usually estimated at 30 inches of mercury, which is very nearly 14½ lbs. upon a square inch, and equivalent to a column of water 34 feet high. In London it equals 28.18 inches, equal to 14.18 lbs.

ATMOSPHERIC EFFECTS. See CORRECTIONS.

ATMOSPHERIC INFLUENCE UPON BUILDING MATERIALS. The influence of the atmosphere upon building materials is of a very complicated nature, and it has not hitherto been studied with the attention it merits; for although much valuable information may be found in the works treating upon materials, yet in no case has it been considered in a consecutive, systematic manner, nor have the laws affecting the phenomena of this description been examined with the detail they require. It would be difficult, however, to exaggerate the importance of the action produced by this agent, either with respect to the stability, or even to the æsthetic effect of buildings. In the following notice, it has been attempted to connect the information contained in the best authorities, and to convey some practical observations made in the northern temperate latitudes. It must be observed that no absolute rules are laid down; every situation may differ from the normal conditions in some climatological circumstances; every building material is subject to changes of composition, which cannot be predicated; so that at all times it will be necessary to examine the local causes which are likely to modify the application of the general laws.

The atmosphere acts upon building materials both chemically and mechanically; and these actions are again complicated by the variable conditions of moisture, heat, and electricity under which it may exist. It acts under circumstances apparently so dissimilar, that great attention is required before its effect upon the durability of building materials can be understood. In some cases, the atmospheric influences tend to destroy; in others, to consolidate; but in all the results they produce are very marked, and such as to call for the serious consideration of the architect. Limes, cements, and building stones, when properly employed, gain in strength and durability by the slow, but certain, chemical action of the air. When injudiciously employed, on the contrary, they rapidly decay, either in consequence of the decompositions to which that element gives rise, or of the action of the mechanical agents to which it serves as a medium; and the destruction of metallic or organized substances, under the influence of this all-pervading medium, is, if possible, more apparent than that of the class above named.

The class of *granites* presents many varieties, differing greatly in their composition, and the mechanical arrangement of their ultimate elements. The granites from Devonshire and Cornwall contain a large proportion of schorl, and are frequently pervaded by masses of felspar of such dimensions, and so distinctly crystallized as to cause the rock to assume a porphyritic character. According to Sir H. DELABECHE, the granites of Ireland are of the same character, excepting that the schorl occurs in smaller proportions. The granite of Aberdeenshire is more decidedly micaceous, and schorl is rarely to be found; this granite also differs from its congeners of England and Ireland, in the fact that the various materials are more equal in their volume, and more evenly distributed. In some cases, hornblende is substituted for the mica; and in others, the quartz and felspar are both so much affected in their colour, doubtlessly by the presence of some form of hydrous oxide of iron, as to give a general rosy hue to the whole mass of the rock. An instance of this is to be found in the well known granite of Peterhead. The granites of Guernsey, Jersey, and the isles Chausey, which are occasionally brought into the London market, resemble the same material obtained from Cornwall; and indeed McCULLOCH, in his classification of rocks, states that they pass into the same variety. Their appearance is, however, sometimes diversified by the occurrence of large imperfectly-shaped crystals of compact felspar, which give the whole mass either a greenish tinge, as in the case of

the Guernsey, or a rosy tinge, as in that of the Jersey, granites.

The decomposition of granites takes place in consequence of the action of the moisture contained in, or supplied by, the atmosphere upon the lime and potassa, which enter largely into the composition of the felspar; the oxide of iron in the mica and felspar usually exists as a protoxide; it has, therefore, a tendency to take up more oxygen from the air, and at the same time it takes up a portion of hydrogen, becoming thus a hydrous-oxide which is easily removed by rain; the magnesia and alumina which enter into the composition of this class of material are highly susceptible of disintegration and removal by air and rain, and it would even appear, from the researches of M. EBELMEN and SENNARMONT, that the silica of the quartz is liable to the same action.

There appear, however, to be different conditions in the chemical combinations of the bases of felspar, which give rise to some anomalous phenomena in its resistance to the action of the atmosphere. Thus, the Egyptian porphyries, which contain a notable excess of felspar, are but slightly affected; and in some Devonshire granites the distinct crystals of that mineral resist decomposition so much more effectually than do the other materials, that they stand out in bold relief. Possibly this may be accounted for by the closeness of the texture of the crystallized felspar, which would, to a certain extent, prevent the moisture contained in the atmosphere from communicating with the molecules of the interior; or possibly the more simple character of the porphyritic rocks may be favourable to their preservation, because the different rates of expansion of the mechanical ingredients must have a material influence on the disintegration, should these ingredients exist in considerable numbers. The difference in the rates of decomposition of the porphyritic granites of Spain, of Brittany, and of Cornwall, in which it is very rapid, from that of the Egyptian porphyry, in which it is very slow, appears to justify the inference that the latter supposition may have some real value. The former granites are in fact composed of many more ingredients than the Egyptian porphyry, in which both the mica and hornblende are wanting. It may be for the same reason that the uniform character of the Aberdeen granites enables them to resist atmospheric influences in our latitudes more successfully than the Devonshire or the Cornish granites.

The *whinstones* and the *basalts* disintegrate unequally under the effects of exposure to the atmosphere, in consequence of the variable proportions of felspar they contain, and perhaps also of the particular combinations of the alumina, lime, and magnesia, which, with silica, constitute the base of the rock. If any potassa be present in combination with the silica, in the shape of felspar, the decomposition is more rapid than under ordinary circumstances; for, under the influence of the humidity of the atmosphere, the felspar is decomposed into two bodies, one of which is soluble, and easily removed by succeeding rains. The serpentines and diallage rocks, which are silicates of magnesia, combined with hydrates of that base, yield easily to the attacks of acids, when the silicates are present in certain proportions and when alumina is present. The most beautiful varieties of these materials employed in the arts are obtained from the environs of Genoa, or from Töplitz in Saxony; but it is much to be feared that the atmosphere of large towns, especially of those in which the combustion of coal introduces sulphuric acid, will render the employment of even the best of these materials hazardous, in external works at least. It would also appear that the constituent elements of serpentines are exposed to unequal contractions in parting with their water of crystallization on exposure to the air, the consequence necessarily being that the material breaks in an irregular manner.

The *slate* rocks worked for the supply of the London market are principally those of North Wales, Cornwall, or Westmorland and Cumberland. The Welsh slates are obtained from a tolerably homogeneous clay slate; the best descriptions of the Cornish

slates are of the same nature; but those of Cumberland are distinguishable by their colour, which is owing to the presence of chlorides. Exposed freely to the action of the atmosphere, both varieties appear to resist tolerably well; but the Cumberland slates decay rapidly in damp positions, when the air around them is not frequently renewed. They decay, in fact, in the covered parts; probably in consequence of the decomposition of the silicate of iron they contain. It would appear that the combination of the silica and alumina in the Welsh slates is more stable than that which prevails in any other material of the same nature; for their powers of resistance to atmospheric influences are greater than those of any other slates employed at least in Western Europe. As a general rule, the denser the slate the more durable will it be; and the most important condition to be observed in its application is that no rain water should be allowed to enter the edges of the layers. Practically, also, it is found that the smoother the surfaces of the slate, and the closer they may lie, the greater is the pitch requisite; because under such circumstances capillary action takes effect to a greater extent than when the slates present irregular and perceptibly large intervals, which intervals again are of service by allowing air to circulate freely.

The various *sandstones*, *millstone-grits*, and *conglomerates*, are affected by the atmosphere in consequence of the decomposition of the cementing material by which their elements are held in connexion, or by the mechanical effects of rain. These last consist, primarily, in the destruction of the cohesion of the molecules by the expansion of the water in freezing; and subsequently in the removal of the cementing material. Many of the sandstones occur in layers separated by films of a more argillaceous matter; and when these films are sufficiently dense to retain any water which may fall upon the stone, and to keep it in contact with the sandy layer, the expansion during frost, or conversion into steam, will inevitably destroy the stone. It is on this account that the porous and the highly fissile Yorkshire stones do not resist when exposed to the weather. The best materials of this description are those of an homogeneous nature, such as the Park Spring, or the Idle, or the Darley Dale stones. **SILICA.**

The *sandstones* in which the silicious molecules are united by a calcareous cement are more susceptible of decomposition than those united by a silicious cement; for it appears that the combination between the lime and the silica in such stones is rarely of an energetic nature, and the lime is easily washed out. Messrs. EBELMEN and SENNARMONT have observed that even the purely silicious rocks are affected in the course of time by the dissolving action of water; and if any metallic bases should be present in them, those bases may be entirely removed by the oxidizing effects of the water. When stones are placed in a building, of course the latter agent can only affect the exposed surfaces; it becomes, therefore, important to select the purest and most homogeneous materials for such positions. If these precautions be observed, the *millstone-grits* will successfully resist exposure to the atmosphere; and these remarks may be equally applied to the *conglomerates*, which only differ materially from the *grits* in the dimensions of their constituent elements.

Crystalline marbles decay under the influence of the atmosphere in various manners occasioned by the endless varieties of their composition, and the modifications to which they have been exposed. They are often traversed by fissures filled in by more perfectly defined crystals of the base of the rock, or by other extraneous matters, such as clay, or even by minerals; and however regular the stratification of the mass may appear, they are often marked by a distinct cleavage, differing from the direction of the planes of stratification. The atmosphere may, under these circumstances, either furnish the elements necessary for the chemical decomposition of the materials introduced to the fissures; or it may supply the water, which may mechanically separate the mass by infiltrating between the divisional planes. It is to be observed that the more crystalline

any limestone may be, the more it is exposed to the danger superinduced by the cleavage; but, at the same time, the process of crystallization appears to be accompanied by the development of some chemical affinity between the ultimate elements, which enables them afterwards to resist external causes of decay. This law seems to hold equally with the calcareous, or the silicious, rocks. In a memoir *On the Absorption of Atmospheric Water by Mineral Substances* (Comptes rendus de l'Académie des Sciences, 1853, vol. xxxvi), M. DUROCHER states that all silicated materials, or those containing metallic oxides, actually absorb moisture from the atmosphere, and undergo a commencement of hydration, which must necessarily facilitate the decomposition of mixed minerals, and is apparently the commencement of that action. Messrs. JAMIN and BERTRAND have also shown that in porous bodies gases are condensed with remarkable facility; so that it is possible that the conditions of molecular arrangement may influence the decomposition of mineral substances in the direct proportion of the facilities which are offered to the passage of air to the interior. It may thence be inferred that the existence of the crystalline structure is in itself a protection to the materials in which it may occur; because under such circumstances the porosity is usually smaller than in the case of materials held together simply by aggregation. Sir H. DELABECHE (*Geol. Obs.*, edit. 1851, p. 8), notices the universality of this law, but he does not attempt to account for it.

The various *secondary and tertiary limestones* decay with very variable degrees of rapidity, and even in the same formations it is by no means uncommon to find that the materials extracted within very limited distances differ appreciably in their powers of resistance to atmospheric influences; the position the stones may have occupied in the quarry, and the exposition of the building in which they are employed, appear also to exercise an influence on their durability. It rarely happens that the chemical nature of the principal materials of these formations is uniform over a large area; for the proportions of the metallic oxides, or of the earthy bases, in connexion with the carbonates of lime, are susceptible of every possible variety. In all those deposits, also, which have not been affected by contact with igneous rocks, there is another chemical agent at work to hasten the progress of decay, namely, the animal matter they so often contain; and as this is distributed irregularly, its effects cannot be reduced to any invariable law. NITRATES, EFFLORESCENT SALTS.

Experience has shown that the *magnesian limestones* are no more able to resist the action of London atmosphere than the carbonates of lime formerly used, provided that the same care be exercised in their selection. Indeed, it is to be suspected, from what may be observed at the Houses of Parliament, and at Lincoln's Inn Library, that the former description of stone is even more inclined to effloresce, or to saltpetre, than the ordinary stones. There is little known at present, at least with certainty, of the phenomena connected with the production of this inconvenience; but it takes place in nearly all building stones of a porous nature, and it is believed that on this account, as also on their smaller degree of absorption, the stones (that is to say of those obtained from the same geological formation) which are the densest, are most likely to resist the action of the atmosphere. The practical rules to be adopted in the use of building stones, in order to avoid as far as possible the saltpetreing, or the ordinary causes of decay, are as follow:

1. To employ in damp positions either granite, the millstone-grits, or the conglomerates of a purely silicious nature, or sandstones free from animal matter, or any notable proportions of the sulphate or the oxide of iron, in preference to any other description of stone. If limestones must be used in such positions, then the densest and most crystalline must be selected, and the absorption of water by the superstructure arrested by the interposition of a layer of some impermeable material.

2. Every precaution must be taken to prevent the saturation of the ordinary limestones by sea water, and the use of sea sand in conjunction with them must be carefully avoided; because sea water furnishes the salts of soda, which are most efficacious in the formation of nitrates, and the sand is impregnated with the same salts. SEA SAND and WATER.

3. All stones exposed to saltpetre, or to admit of the formation of nitrates, must be completely detached from all decorative works.

Of late years, attempts have been made to cast doubt upon the universally received opinion that it is essential to use stones in the same direction of bedding as they occupy in the quarry. With some few materials of this description, it may be a matter of indifference whether this opinion be followed or not; for the Villebois stone of the neighbourhood of Lyons, and the roche de S. Cloud near Paris, have been habitually employed without reference to the planes of stratification, and no inconvenience has resulted. But these cases are exceptional; and with them the powers of the stone to resist a crushing weight are less when it is applied in a direction parallel to the stratification, than when it is applied transversely to those planes. As a general rule, when stones are used, in workman's phrase, bed to the weather, they disintegrate in parallel flakes; but it is nearly as essential to attend to the direction of the planes of cleavage, or to the inclined layers of deposition to be noticed in some of this class of materials, as to that of the stratification, because if they be not attended to, they produce effects which are nearly identical with those usually accompanying the neglect of the latter.

M. BRARD proposed some years since a process by which it was long believed that it was possible to imitate in the laboratory the expansive action of water in freezing, and to arrive at correct opinions of the resistance of stones to that action, without being obliged to resort to actual experiment. The process is described at length in RONDELET's *Art de Batir*, ed. 1842, Paris; and it may be briefly stated to consist in the immersion of the stones in a solution of sulphate of soda, and allowing the salt to effloresce. But, in the *Annales des Ponts et Chaussées*, vol. vii, 1re série, MM. MINARD and VICAT throw very considerable doubts upon the real value of BRARD's invention. Indeed, as M. VICAT observes, it is hardly probable that the expansive action of freezing water should be identical in its effects with those produced by crystallization which takes place at temperatures between 68° and 86° Fahrenheit; and recent experience has demonstrated that stones which resisted the action of the salt, have been unable to resist that of frost. Mr. C. H. SMITH, in his paper entitled *Lithology*, given in the *Transactions* of the Royal Institute of British Architects, 1840, states that experience has shown in well known stones the results to be quite different from those arising from M. BRARD's process. VICAT observes, and his remark is confirmed by what is to be seen in London, that stones which are exposed to a southerly aspect are more affected by frost than those exposed to the north; and he adds, that the most efficient protection is a coating of oil paint, or of any other fatty pigment which shall prevent moisture from being absorbed into the stone. M. MINARD recommends that building stone should be quarried in the spring, and not used until it has been exposed to the effects of at least one winter. CRYSTALLIZATION, DILATATION, LITHOLOGY.

When the *gypseous* formations occur on a large scale, they are occasionally resorted to for the purpose of extracting rubble stone for walling; but they absorb moisture from the atmosphere, and decay with such rapidity, that the municipal authorities of Paris have found it necessary to forbid their use, in this form, for house building. The cause of this rapid decay is attributed by GMELIN to the fact that all sulphates with an earthy base (the gypsum is a sulphate of lime) are soluble in water. It is also to be observed, that many of the gypseous formations contain an extraordinary proportion of organic matter. This de-

composes on being exposed to the action of the nitrogen of the atmosphere, and it gives rise to the formation of nitrous salts on an extended scale: indeed, to such an extent does this take place, that the saltpetre used in the French powder manufactories, during the last war, was almost entirely obtained from the old plaster materials furnished by the demolition of cellars.

The chemical nature of the *clays* employed in the manufacture of *bricks* and *tiles*, and the nature of the calcination to which they are exposed, affect the resistance of this class of materials to atmospheric influences in a very perceptible manner. Thus, if any distinct portions of limestone should exist in the clays, they will be converted into quick lime in the kiln; and when the bricks are subsequently wetted, the expansion of the lime will tend to disintegrate the mass around them. If the clay be too poor (that is to say, if it contain an excess of sand), the bricks do not become sufficiently fused, and upon exposure to the weather their constituent elements disintegrate. Much depends also upon the chemical state of the silica in the clay; for if it be not in the state known to chemists as free silica, it will not form an insoluble silicate of alumina during calcination. Some part of the decay in bricks and tiles must be attributed also to the metallic oxides contained in the clays from which they were made. CERAMIC ARTS.

Few classes of building materials exhibit such variable powers of resistance to atmospheric influences as *limes* and *cements*; and these differences are sufficiently connected with the more distinctly marked chemical characteristics to justify assigning them to the latter. Thus, in the case of the pure (or rich) limes, or those obtained from the calcination of carbonate of lime in its purest state, the caustic lime has a great avidity for, and is entirely soluble in, water: if therefore it be exposed either to the action of the atmosphere, or to that of running water, it will be entirely removed. In the case of the hydraulic limes, or those obtained by the calcination of the argillaceous limestones, the lime, alumina, and silica, form a double salt, which is insoluble in water; so that if the mortars made from them be protected during the period required for their setting, they will eventually be able to resist either the atmosphere or running water. The practical inference to be drawn from these facts is, that none but the hydraulic limes should be used in damp situations. With respect to plasters, the observations before made upon gypseous stones will apply, but perhaps with greater force, because they appear to yield, when calcined, even more rapidly under the influence of the atmosphere than the stones themselves. Cements, like the limes, resist these causes of decay, in the precise proportion of the energy with which the double silicate is formed. CHEMICAL AFFINITY.

It is now generally believed that the hardening of limes, cements, and plasters, depends upon other causes than the absorption of carbonic acid gas from the atmosphere; for the quantity of the latter which is present at any one time is so small, that it cannot suffice to explain the hardening. Subsequently to the first change of condition, however, the absorption of carbonic acid has a very marked influence upon the conditions under which these materials occur; and they are found to increase in their powers of resistance to external agents, in proportion to the extent to which that absorption has taken place. But it must always be borne in mind, that carbonate of lime, equally with carbonate of magnesia, is soluble to a great extent in pure water. Although, therefore, this class of materials may resist the action of the atmosphere in dry positions, and even increase in their powers of resistance; yet if they be exposed to running waters, they will eventually and infallibly be affected. Surfaces alternately wet and dry are acted upon in a similar manner to those more constantly moistened, although in a different degree. Temperature appears to have a very distinct influence upon the durability of this class of materials, and their application at certain periods of the year, therefore, requires precaution. In summer, if the water of crystallization be allowed to evaporate rapidly, unequal contraction takes place;

in winter, the expansion of this water frequently produces the disintegration of the whole mass. The limes, cements, or plasters which solidify with the greatest rapidity, are the most exposed to crack.

Wood or timber is affected by an additional class of phenomena to those already noticed, namely, such as are connected with organic chemistry, although, when the trees from which it is obtained have been once felled, they are exposed to the influence of inorganic causes equally with the materials hitherto considered. Decay in wood arises either from the fermentation of the sap, or from the attacks of fungi. The former cause varies in its operations with the temperature and the hygrometric state of the atmosphere; the occurrence of the latter does not appear to be subject to any invariable law, damp positions, to which air has little access, must, however, be considered to be those most likely to develop the growth of the parasitical plants. It must, however, be observed, that the albumen of the sap must have decomposed, before the parasites can obtain the requisite conditions for their development. Warmth and moisture are the agents which facilitate the decomposition of the albumen, and the extent to which they depend upon the atmosphere is notorious. Every measure, therefore, proposed for the preservation of wood, must be based upon the principles of either removing the albumen, the great primary cause of decay, or of converting it into a permanent insoluble substance. The common process of seasoning effects both these objects, to a certain extent, for the evaporation of the water leaves the albumen in a state of desiccation which does not allow fermentation to take place; but if any excess of moisture should be present in the atmosphere, the albumen is capable of again absorbing it, and is then susceptible of decomposition, as in its original state. Timber which has been thus naturally seasoned is at all times exposed to resume, from the atmosphere, the elements of decay; so that it would appear the wiser course to employ processes for the preservation of timber which are based upon the annihilation of the destructive element. It may be added, that when timber naturally seasoned is in place, it may be protected from external agents by paint; but if the whole of the moisture of the albumen has not been evaporated, the very perfection of the protecting coat will only be found to hasten the process of decay. WOOD.

The hygrometric state of the atmosphere, not only has a decided influence upon the chemical elements of timber, but it mechanically alters its form. These changes are of a complex nature, and not only affect the volume of the pieces exposed to their influences, but it appears also that a species of movement of rotation is communicated to the fibres, analogous to those observed in hygrometric chords.

In building operations the metals most ordinarily employed are iron, lead, copper, tin, zinc, and some mixed metals, such as *brass*, *bronze*, or *gun-metal*. They are all susceptible of atmospheric influence to a remarkable degree, and indeed under that influence give rise to phenomena of a more complicated nature than those already noticed; because the metallic bases combine with a greater number of gases than the earthy ones, and moreover, this class of materials is particularly susceptible of the influence of electricity and galvanism. Decay of metals, however, is principally dependant upon the absorption of oxygen from the atmosphere; but this cannot take place to any serious extent unless carbonic acid be present. The immediate contact with an enveloping body, therefore, which is susceptible of absorbing carbonic acid gas, will serve materially to protect metallic substances; and it is universally known amongst practical authorities, that the electrical balances produced by certain mechanical actions, or the galvanic state produced by certain juxtapositions of metals, will prevent the absorption of oxygen to a remarkable extent. Other modes of juxtaposition will, however, produce effects diametrically opposite; extreme care is, therefore, requisite in the manner of their joint employment. The preservative effects of galvanic action are rather the excep-

tion than the rule; and it may be taken to be a general law, that when two metals are in contact with one another, and water or moisture has access to them, they will decay rapidly. ELECTRO-CHEMISTRY.

Temperature, and the electrical state of the atmosphere, have a very perceptible influence on the resisting powers of metals to mechanical strains; under the action of either of them their tenacity has been observed to be materially affected, and temperature is universally known to produce a linear dilatation, which requires to be taken into account whenever they are employed. A similar dilatation takes place in the cases of wood, stone, or brick; but its amount is so small in proportion, that its consideration may be neglected in ordinary cases. Recent experiments show that the resistance of metals diminishes with increase of temperature more rapidly than the dilatation takes effect. HEAT.

In the case of glass, the action of the atmosphere appears principally to be confined to the chemical decompositions produced by the influence of moisture on the earthy bases, or by the removal of the alkalis in combination. Of course these changes are more perceptible in some positions than in others. and they are most deleterious in atmospheres which contain ammoniacal or sulphuretted hydrogen gas.

Oil paints are supposed to solidify and to be indebted to their powers of resistance to external agents, to the absorption of oxygen from the atmosphere by the oils, and from M. CHEVREUL's experiments, this absorption appears to be materially affected by the combination which takes place between the oils and the various driers employed. When metallic substances are introduced for the purpose of giving colour, it is necessary to calculate upon the infinite series of chemical actions to which they give rise. The success of ornamental decoration depends entirely upon the resistance of these bodies to the effects of the various gases in suspension; and the use of *varnishes* is principally to be found in the defence they offer to the immediate attacks of these agents.

Much information on the subject of this article is to be found dispersed in the following works, which have also been consulted:—SIR H. DELABECHE, *Geological Observer*, 2nd edit., 8vo., Lond., 1853, and *Report on Geology of Cornwall*, 8vo., Lond., 1839; C. H. SMITH, *Lithology*, given in *Transactions of the Royal Institute of British Architects*; and in WEALE, *Quarterly Papers on Architecture*; BRANDE, *A Manual of Chemistry*, 6th edit., 8vo., Lond., 1848; MACCULLOCH, *Classification of Rocks*, etc., 8vo., Lond., 1821; BOASE, *Treatise on Primary Geology*, 8vo., Lond., 1834; THOMSON, *Introduction to Meteorology*, 8vo., Edinb., 1849; HOWARD, *Climate of London*, 8vo., Lond., 1833; GMELIN, *Handbook of Chemistry*, translated by H. WATTS, in progress, 8vo., Lond.; KNAPP, *Chemical Technology*, 8vo., Lond., 1848; *Transactions of the British Association for the Advancement of Science*; *Transactions of the Philosophical Society of Manchester*; and the *REPERTORY OF ARTS*; RONDELET, *L'Art de Batir*, 6th edit., 4to. and fol., Paris, 1830-32, and *Supplement* by BLOUET, 4to. and fol., Paris, 1848; BRONGNIART, *Traité des Arts Céramiques*, 2nd edit., 8vo. and fol., Paris, 1854; SGANZIN, *Cours de Construction*, 4to. and fol., Paris, 1839; DUMAS, *Traité la Chimie appliquée aux Arts*, 8vo. and 4to., Paris, 1828-46; BRARD, *Nouveaux éléments de Minéralogie*, 3rd edit., 8vo., Paris, 1838; BURAT, *Geologie Appliquée*, 8vo., Paris, 1846. The treatises by EBELMEN, SENNARMONT, CHEVREUL, JAMIN, and BERTRAND, will be found in the following works, which may also be referred to throughout:—*Les Comptes Rendus de l'Académie des Sciences*; *Les Mémoires de l'Académie des Sciences*; *Les Annales des Mines*; *Les Annales des Ponts et Chaussées*; *Les Annales de Chimie et de Physique*; *Les Annales d'Hygiène*. G. R. B.

ATRAMENTUM. The name of a black colour used by the ancients, of which there were the artificial, the natural, and the Indian, (DEMOSTHENES, *De Coronâ*, uses the phrase τὸ μέλαν

τρίβειν, to rub up the ink); the composition of the latter, though unknown to the Romans, was imitated by them with the dregs of wine: these dregs carbonized, or ivory calcined, or lamp black, were the artificial materials for writing or drawing ink, *atramentum scriptorium*; the natural blacks were made from a black earth, or from the blood of the cuttle fish, *sepia*, *CHALCANTHON*. *Atramentum sutorium*, or blacking, a vitriolic black, was used for staining woods: *Atramentum pictorium*, or *tectorium*, was a black of which the composition is not mentioned, it was sold in powder, and when mixed with glue, was used for paintings upon walls. PLINY, *H. N.*, ix, xi, xx, xxiv, xxvii, xxviii. xxxii-vi.

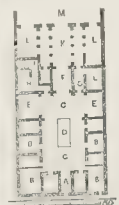
ATRANI. A village which adjoins the city of AMALFI in the province of Principato Citra in the kingdom of Naples. It is known best for a fine pair of bronze doors to the church of S. Salvatore, which bear an inscription showing that they were erected in 1087 by Pantaleone Viarecta. J. M. L.

ATRI or ATRIA (the Roman HADRIA, or HATRIA PICENA). A city in the province of Abruzzo Primo Ultra in the kingdom of Naples. It contains a cathedral dedicated to the Virgin; and one parish church, besides others belonging to the several convents; two hospitals, and an ecclesiastical seminario. In the vicinity of the town are a number of chambers excavated in a hill, with greater regularity than to allow of their being considered merely quarries. 50.

ATRIENSIMUM. The name given to the closet which, in some of the houses discovered at Pompeii, was supposed to have been appropriated to the *atriensis*, a porter or servant having charge of the ATRIUM.

ATRIOLUM. The Latin diminutive of ATRIUM, and therefore explained to mean generally a small atrium; but the word is also explained by RICH, *Illustrated Companion*, 12mo., London, 1849, quoting CICERO, (*Att.* i, 8. *Quint. Fr.* iii. 1) as a distinct portion of the large Roman mansions, which might be called a second or back atrium.

ATRIUM. This Latin word, translated a hall or a court, appears to have been used by the Romans, not only for a variety of cavedium in a private dwelling, but also for a sort of public building. VARRO, *De Ling. Lat.* iv, states, that the cavedium was a covered large space, used in common within the walls of a house, and called Tuscanicum, after the Romans began to imitate the manners of the Tuscii: and he intimates that the atrium was so called from the name Atria of a Tuscan town; but SERVIUS asserts that the kitchen was originally placed therein, and that it was called *atrium quasi atrum*, on account of the soot from the smoke. CATO states that before his time, (B.C. 234-149) the Romans were accustomed to sleep in the atrium with the (house) door open. VITRUVIUS confirms the opinion of VARRO: in vi, 3, he describes five sorts of *cavedia*, one of which is called Tuscanicum; in vi, 4, he makes the TABLINUM (F) ALÆ (E) and FAUCES



(e) essential to an atrium properly so called; he does not merit the charge of confounding his technical terms in vi, 3, as the word atrium should there be understood as implying a complete atrium, as shown (c c) in the illustration; for in vi, 8, he mentions that vestibules, *cavedia*, and peristyles, were sufficient for a man of moderate fortune, as such a person did not require magnificent vestibules, *atria*, and *tablina*; and that in the country the peristyles were usually between the atrium and the entrance door, while in the city, the atrium was placed between the peristyle and the entrance.

This last condition was observed in almost every house which has been discovered in Pompeii, and these examples explain better than any other commentary, that the atrium was in fact the most important, and among the most splendid of the apartments in a Latin mansion. In it the ancient Romans erected the nuptial couch; the mistress and the servants spun

and wove, repasts were served, clients were received, and the fellow-subjects of VITRUVIUS displayed family pictures and ancestral statues; while the *focus* or hearth, elevated a little above the floor, possessed a sacred character, as being dedicated to the family Lares, or titular deities of the house, whose images, and often those of the guardian deities of the street or town, were exhibited in shrines, *ædiculæ*, around the walls; the *armarium* and the money chest of the public officers were also placed in the atrium. The Romans of the Republic lodged their visitors in chambers opening into the atrium, thus giving them the use of a magnificent reception room, (VITRUVIUS gives proportions suitable to the size of 100 feet long, and 60 feet wide), and access to it at all times without causing disturbance to the family. As regards the construction and support of the roof of the atrium, reference may be made to the articles *CAVÆDIUM*; *COMPLUVIUM*; *IMPLUVIUM*. 25. 78. 79.

The following are the references to the illustration: A, prothyrium or vestibule; B, rooms and a shop surrounding the Tuscan atrium C; D, impluvium; E, E, alc; F, tablinum; G, fauces, with its corresponding opening on the opposite side; H, antechamber to staircase I, which communicated with the story under the terrace M; K, Corinthian æcus; L I, rooms for various uses.

MAZOTS, *Ruines de Pompèti*, fol., Paris, 1829, ii, 20, after remarking that the form, construction, and principal parts of the atrium were skilfully comprehended by PALLADIO, whose ingenious application of them to his own designs for modern dwellings may be regarded as a new invention to some extent, concludes that atrium was the general name for the public part of the mansion, an opinion which may possibly be correct as regards the period after the time of VITRUVIUS; he quotes AULUS GELLIUS, *Noct. Att.* xvi, 5, who mentions that some persons thought the vestibule was the anterior part of the house called the atrium; but VIRGIL mentions long atria as visible when the door was opened: thus also when SUETONIUS and MARTIAL are describing the situation of a particular statue, one places it in the atrium, the other in the vestibule. The difficulty would be at once explained, if it could be supposed that the atrium mentioned by PRIN, in the account of his Laurentine villa, was a sort of building resembling an open basilica, but consisting only of three sides: for according to QUATREMÈRE DE QUINCY, *Diet. s. v.*, an atrium was sometimes attached to a temple, and was then an open area with a surrounding portico in front of the structure: it must be noted that CICERO, *Agr.* i. 7, rather speaks of *atria auctionaria* in the forum as dark places: QUATREMÈRE, however, instances the atria of Vesta and of Liberty; and an apparently semicircular building marked ATRIUM LIBERTATIS (LIVY, xxiv, 10), is seen on the vestiges of the marble plan preserved in the Capitol at Rome.

It was probably from such a mode of using the term that it came to be applied to a court, which sometimes served as a cemetery, surrounded by arcades or colonnades, and placed in front of the early Christian churches; thus EUSEBIUS, *Hist.*, x, 4, speaks of a magnificent atrium erected in front of the church of Sta. Sophia at Constantinople. GARSONOSTASIUM. LEONTORIUM. PROAULIA. Perhaps the most perfect specimens of such atria now in existence are those at the churches of S. Clemente at Rome, and of S. Ambrogio at Milan, which was erected A.D. 882, and repaired by Francesco Ricchino, in 1631, for Cardinal Federico Borromeo. GAILLY KNIGHT, *Eccles. Architecture of Italy*, fol., Lond. 1842, i, 25; GAILHABAUD, *Monumens*, etc., 4to., Paris, 1852.

BINGHAM, *Opera* i, 289, is held to assert that the cloister was thus called, and was nearly synonymous with the narthex, which could only be a part of it; other writers have confounded the atrium with the first porch or vestibule, ANTE-PORTICUS, from which it was distinct. It was the place assigned to penitents who in their first stage of reconciliation to the congregation, stood in the atrium to beg the prayers of those

admitted into the nave. Atrium was also used, in the course of time, for a churchyard or cemetery simply, and it is defined in the old law books as the space of forty paces round a large church, and of thirty paces round a small church or a chapel. 13.

ATTACAMITE, sometimes written ATACAMITE.

ATTACHED. Columns engaged in a wall are called attached columns. With respect to attached buildings, the Metropolitan Buildings Act, 7 & 8 Victoria, chap. 84, schedule C, declares that with regard to buildings or offices, (except greenhouses, etc.) whether such buildings or offices be attached to or detached from the buildings to which they belong, every such building is to be deemed, in respect of the walls thereof and all other requisites, as a building of the rate to which it would belong if it had been built separately. An important award is given in the *BUILDER Journal*, page 102, vol. xii.

ATTALEA SPECIOSA (*uauassú*, signifying "large fruit".) This noble palm, a native of the dry forest lands of the Upper Amazon, South America, has a stem straight, cylindrical, and nearly smooth, averaging from fifty to sixty feet in height.

The unopened leaves from the centre are used for thatching, and are preferred to the others, though they require more preparation; they are generally known as *palha branca*, or white thatch, from the pale yellow colour of the leaves, and are considered the best covering for houses in places where *bussú* (MANICARIA SACCIFERA) cannot be obtained. WALLACE, *Palm Trees*, 12mo., London, 1853.

A. spectabilis (*curud*) found on the Rio Negro, is also used for the same purpose.

A. excelsa (*urucuri*) is found on the Lower Amazon; the fruit is burnt, and the smoke used to blacken the newly made India rubber.

A. funifera produces stony seeds, which supply a kind of vegetable ivory.

ATTALEIA or ATTALIA, now ADALIA in Anatolia.

ATTALUS, see CALUS.

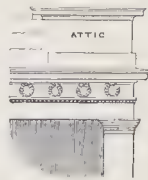
ATTEGIA. The word employed by JUVENAL, *Sat.* xiv, 196, for a cottage or hut made of reeds and thatch, used in Mauritania; it is also the late Latin term for a small house, or cottage.

ATTENDOLO, (AMBROGIO) is commemorated in the church of Sta. Caterina de' Frati Francescani at Capua, by the following inscription:

Ambrosius Attendolus qui ob intemeratam fidem Philippo II Hispan. Regi præclarus ejusque in Neapoli Regno summus architectus Capua Crotona Cajetaque mathematica ratione munitis Neapolim Puteolosque vis pietate clarus hic parentis cineribus contumelatus est obiit A. Dom. MDLXXXV. Ætat. suæ lxx. 36.

ATTIC. (It. *attico*; Sp. *ático*; Fr. *attique*; Ger. *attike*). The name given by the architects of the seventeenth and following centuries to the portion of a façade which was placed by them over the regular orders. It is described by D'AVILER, *Art de bâtir*, 4to., Paris, 1693, as having formerly meant "a building in the Athenian manner", that is to say, with "a little story or pedestal, either of stone or wood, covered with lead, serving as a kind of parapet to a terrace, platform, or the like", in which no roof appeared; and as being in his time applied to a low story then placed upon the corner pavilions and the centre of a building: no antique Greek example, except the monument of Thrasylus, could be cited. Modern architects have ornamented the space of the attic with a bastard order, if it can be called an order, a species of decoration of which the precedent is found in antique triumphal arches and city gateways: ATTIC ORDER. The word subsequently

was used to express the space occupied by the walls of the story above the principal cornice of a building: this space generally contained windows, which were considered most suitable when either square or else wider than high; and the rest of the wall was often richly ornamented by panels, figures, vases, trusses, and other decorations. The term was ultimately also applied to any room in the ATTIC STORY of a building. ATTIC ROOMS. Sir W. CHAMBERS, *Treatise*, in the chapter on "Base-



ments and Attics," fully enters into the use and proportions of this species of decoration in Italian architecture. In England the words FALSE ATTIC are used for a wall or other erection screening the roof, but not enclosing rooms; but the Italian architects apply the term to a pedestal between two orders, when one is placed above the other: the French authors also call an entablature of any extraordinary height "*faux-attique*".

ATTIC BASE. The term applied, in conformity with the practice of VITRUVIUS, iii, 3, to a particular base for a column, which he calls "*spira Atticurgæ*"; and describes to be, inclusive of the plinth, equal in height to half the diameter of the column, and in width at bottom to one such diameter and a half: this amount of projection is seen in examples at the Coliseum and Arch of Constantine. The same author prescribes the division of the base in the following words: "let the upper part be in thickness one-third of the diameter of the column, the remainder being given to the plinth; omitting the plinth, let the rest be divided into four portions, and let the upper torus be one-fourth; the other three being equally divided, one half is to be given to the lower torus, and the other to the scotia with its fillets": the fillet at the bottom of the shaft is not counted as a part of the base: and in several examples the plinth is omitted. This form of base has been employed in the Doric, Ionic, and Corinthian orders of the Romans and Italians; its simple elegance having caused it to be regarded as the most generally applicable of all the bases. CHAMBERS has appropriated it to his Ionic order.



ATTIC COLUMN. The name given by the Romans to square pillars, according to PLINY, *Hist. Nat.* xxxvi, 56; who having observed that there are four sorts of columns, viz.: Doric, Ionic, Tuscan, and Corinthian, adds "*præter has sunt quæ vocantur Atticæ columnæ quaternis angulis pari laterum intervallo*." Perhaps the monument of Thrasylus at Athens, was the only remaining antique building preserving an example of an ATTIC ORDER consonant to the passage above quoted.

ATTICURGIC. (Gr. *attikourgic*.) An epithet signifying "in the Athenian style", employed by VITRUVIUS. The commentators have observed that VITRUVIUS used the words Corinthian and Atticurgic indifferently; but they appear to have forgotten that the author makes his ATTIC BASE simpler than that which he gives for the Ionic column; that his ATTIC DOORWAY is considered to be a mean between the simplicity of his Doric and the decoration of his Ionic; and that he considers the Corinthian order as less severe than the Doric, classing it between that and the Ionic: he being in these cases entirely opposed to the views of modern artists, who have rendered their Corinthian the lightest and most florid of all the orders.

ATTIC DOOR. The name applied in conformity with the practice of VITRUVIUS, iv, 6, to a particular doorway, dressings and door, which he describes as rather more ornamental than those for buildings erected upon Doric principles, but less rich than those belonging to works of the Ionic character.

ATTIC ORDER. If this term be not appropriated in conformity with the words of PLINY, xxxvi, 56, respecting ATTIC COLUMNS, to the profile and other details of the monument of Thrasylus at Athens, it can only be given to any composition of pilasters or piers used over columns of a façade. At Thessalonica there is a work probably of the Roman Imperial period, which has statues engaged in dwarf pilasters carrying a cornice, with open spaces between the pilasters: a similar design with the spaces occupied by arches formerly existed at Bordeaux. SERRADIFALCO, *Antichità di Sicilia*, fol., Palermo, 1836, 66, pl. 27. Reference may also be made to the gateways at AUTUN.

Almost all the antique triumphal arches, as well as the order round the forum of Nerva at Rome exhibit instances of attics with piers having the cornice of the attic breaking round them as a capital; these piers are sometimes plain, and sometimes panelled, and have no diminution. At the Arch of Constantine

figures were placed in front of the piers upon blocks as high as the plinth of the base of the attic. In modern times capitals have been designed for pilasters in the place of such piers.

ATTIC PILLAR, see ATTIC COLUMN.

ATTIC ROOM, or STORY. The name given in England to the rooms of the top story under the beams of the roof of a building when there are more than two floors above ground. The name seems to have been derived from the custom of placing at the top of the façade of an edifice, the species of decoration explained under the term ATTIC ORDER. In the Metropolitan Buildings Act, 7 and 8 Victoria, cap. 84, Schedule K provides, that "with regard to rooms in the roof of any building hereafter built or rebuilt, in reference to the number of floors of rooms in the roof, and to the height of such rooms;—there must not be more than one floor of such rooms, and such rooms must not be of a less height than seven feet, except the sloping part, if any, of such roof, which sloping part must not begin at less than three feet six inches above the floor, nor extend more than three feet six inches on the ceiling of such room": but this provision, although headed "*attic rooms*" implies what are properly called GARRETS. ASHLARING.

ATTRIBUTUTE. A mark, an emblem, or a symbol which is employed in architectural decoration as distinctive of a statue, or characteristic of the destination of an edifice. Such are the trident and lyre, respectively belonging to Neptune and Apollo, which have been placed upon buildings devoted to marine affairs or to musical purposes. The bulls' heads attached to the Doric pillars and entablature at Delos might possibly have been allusive to a market or abattoir. The manner in which the medieval artists indicated apostles, evangelists, saints, and doctors of the faith, by fixed attributes often, but improperly called *emblems* and *symbols*, is shown by the ARCHÆOLOGICAL INSTITUTE OF GREAT BRITAIN, *Journal*, 8vo., London, 1845, i, 53, 384.

1. 6.

AUBERT. There is great difficulty in attributing to the three or four French architects of this name, the works which were executed by them respectively. One AUBERT, elected in 1707 a member of the academy of Architecture in Paris, died in 1739, according to LE BAS, *Dict. Encyc.* in the *Univers Pittoresque*, 12mo., Paris, 1840, s. v. *Académie*; but in 1727, according to NAGLER, *Lexicon*, 8vo., Munich, 1835; who, s. n., states that JEAN AUBERT built the celebrated stables and riding house at Chantilly, which belonged to the princes de Condé. An AUBERT was elected in 1725, into the abovementioned academy, and was probably the architect mentioned, s. n., by VIRLOYS, *Dict.* 4to., Paris, 1770, as having directed the construction of the Palais Bourbon, designed by the elder Gabriel, as well as those of the Hôtel de Lassay, designed by L'Assurance, both which buildings belonged to the Condés; and as having designed and executed the Hôtel de Moras, afterwards Biron, in the Rue de Varennes, near the Invalides: but the same author states that Gabriel designed the Hôtel de Moras, and that L'Assurance continued the Palais Bourbon, (which was begun by Girardini in 1722), and designed in 1724 the Hôtel de Lassay. NAGLER states, that another AUBERT, living in 1810, had rebuilt the Hôtel de Soissons, which also once belonged to the Condés, from the design of some other artist.

60.

AUBIGNY STONE. A stone described in the *BUILDER Journal*, 1848, p. 529, as being probably of the same nature as Caen stone, viz.: oolitic, but much more crystalline, with semi-transparent crystals, showing no appearance of ova; very fine grained, as hard or harder than Anston stone, nearly as heavy as granite, and when worked to be sawn wet with sand. There are two workable beds, one averaging 24 inches, the other 15 inches in thickness. The quarries are not at Aubigny, but at a place called S. Pierre Canivet, both at a short distance from Falaise in Normandy.

AUBRY, see GUILLOT (AUBRY).

AUBURN, or ALBURN, the ancient name of the wood of

the CYTISUS, or laburnum, given in consequence of its light colour.

AUBURN, formerly written ALBURN. The name of a colour which is generally understood to be a tint of a shade of red orange, *i.e.*, between white and the reddish yellow colour called saffron.

AUBURN. The capital of Cayaga county in the State of New York, in North America, is chiefly remarkable for its PRISON, which is three-sided, the front being 276 feet, and the wings 242 feet in length. Besides apartments for the keepers, an hospital, a chapel, and the necessary offices, provision is made for 555 cells, each 7 feet long, 3 feet 6 inches wide, and 7 feet high, in five stories opening into galleries, which were built with particular precautions for carrying out the system of solitary confinement, with which it was first opened in 1821: as the system required modification, the plan of congregation without conversation was adopted, it being found that a whisper in front of the cells could be heard on the ground floor.

AUCH. (The Roman AUGUSTA AUSCORUM, in late Latin Ausco). A city in the department of Gers in France, having many interesting old houses in the upper town, which is very picturesque. The cathedral, one of the finest edifices in the south of France, and dedicated to the Virgin, was commenced under Charles VIII in 1489, but not completed until the reign of Louis XIV, when in 1664 it received the addition of a porch and two towers of the modern Italian architecture then prevalent. The body of the building, which is about 347 feet 9 inches long, by 124 feet wide, and 88 feet high, consists of a nave and aisles, with a range of chapels; the east end is terminated by a five-sided apse, each face opening into a smaller chapel of a plan which is an irregular polygon. The transepts do not show exteriorly: the southern one dates from 1625. The nave consists of five bays, the choir of four. The pillars, which are round, and decorated with fillets, carry pointed arches; the rest of the building is chiefly in the style of the Renaissance, except the principal façade, which was executed in 1646-1664: it consists of a basement and two towers, each two stories in height above the roof of the great porch in the third or lowest story. The groined pointed vaulting, the jubé or gallery (1664) carried on coupled Corinthian columns of Languedoc marble, between the nave and the choir; the carved oak work of the choir (1512-1525); and the glass work which is coarse in design, though rich in colour, are said to be scarcely surpassed in France for beauty and good preservation. LEBORDE, *Monumens de la France*, fol., Paris, 1836, pl. 250, 255. GAILHABAUD, *Monumens*, 4to., Paris, 1852, iv. The glass, which is of three periods, *viz.*, that executed by Arnaud de Moles in 1509-1513; that in the choir dated 1626, and the borderings executed by Dencis in 1646, is given in full by LETTU, *Musée Sacré*. The archiepiscopal palace, *hôtel de ville*, the *préfecture*, the royal college, the theatre, the hospital, the large barracks, and four or five institutions for educational purposes, are the only other public buildings, and are not remarkable. Many antiquities, found during recent extensive excavations, have tended to excite a spirit of archaeological inquiry in the inhabitants, who possess a good library and museum.

AUCTION MART. AUCTION ROOM. The first of these terms is employed to denote one or more suites of rooms with the requisite appendages, erected in a single building in a central position, to be let out on occasion to those auctioneers who may desire to make their sales in such localities, for the convenience of the public.

In 1809, it was stated in the prospectus issued by the Directors of the then recently established London Auction Mart, that from the retrospect of less than half a century, it would be found that sales by public auction were very circumscribed, seldom extending beyond a collection of pictures, books, or miscellaneous curiosities; but, that the increased use of such a mode of selling property had rendered unsuitable, the inadequate, and in many cases, ill calculated accommodation pre-

viously existing. This is still the case in most of the large county towns.

An auction mart is therefore little else than the addition of vestibules, strong rooms, halls, staircases, and sometimes coffee rooms, servants' rooms, offices, etc., to an extension of the conveniences required for a single AUCTION ROOM, (ATRIVM auctionarium of CICERO, *Agr.* i, 7), which is the name given to a building that in any complete edifice designed for such a purpose, should contain besides the large room devoted to the concourse of bidders, places for storing goods received for future sale, and for containing until delivery those which have been purchased; private, and clerks' offices, a strong room, and accommodation for porters, servants, etc. In some establishments there are two or more sale rooms. The nature of the property sold therein will of course regulate the mode of construction and lighting: whether the walls are to have shelves or otherwise, the light which is best for a picture gallery is usually suitable for most of the articles generally sold by auction: the absence of pillars in the sale room is desirable.

AUDENARDE, properly OUDENAARDEN.

AUDENARDE (GILES DE) is mentioned in the Wardrobe Accounts of 5 Edward I, (1278) as keeper of the Works at the Tower of London, at Westminster, and at the King's Mews; BRITTON and BRAYLEY, *History, etc. of Westminster*, 8vo., London, 1836, p. 80, give the details.

AUDIENCE-CHAMBER. In England as well as in France and Italy this term is applied both to the PRESENCE CHAMBER in which the sovereign receives ambassadors, and to the gallery, room, or cabinet, in which an audience may be given to envoys or resident ministers. Among the most splendid of such rooms are the *Sala de los embajadores* in the Alhambra; the *Sala dell' Udienza* in the Palazzo Vecchio at Florence; the bed-chamber of Louis XIV, with the *salle d'Apollon*, which served as the *salles d'audience*, and the Great Gallery, built by Le Brun at Versailles: the ministers and some chief magistrates abroad have also their audience chambers. In Spain, the sala de audiencia was a court of justice, in which the judges, from whom there was no appeal, decided upon all matters arising within their district; being in effect similar to the parliaments which existed in France until the end of the eighteenth century. The hall at Doctor's Commons is the audience chamber of the archbishop of Canterbury, who can there hold personally a court of audience; as the other English Metropolitan can at York. 13.

AUDITORIUM. The Latin name given to any place constructed for the accommodation of persons who had to listen to others; QUINTILIAN, ii, 11, x, 1; in short, any place for the display of eloquence. When shelter and convenience were needed, the Roman tribunals were removed from the forum etc. in the open air, to the basilicas, whence these halls were called *auditoria*. The word was also applied to the official seat of a magistrate or judge when engaged in determining a cause; and the *auditorium principis* was afterwards termed *secretum*, or secretarium. The term has been appropriated in modern as well as in ancient times to that portion which was occupied by an audience in an odeum, theatre, or lecture room, corresponding to the VISORIUM of the ancient amphitheatre.

In the middle ages the word denoted the portion of a church where the congregation, not being permitted to enter the choir, remained during the service, and where the catechumens stood; hence the term was soon given to the whole nave: BINGHAM, *Opera*, i, 291. Some writers say that the ambo was also so called. The school-rooms in monasteries had the same name, which was also applied to an apartment for the reception of strangers in conventual establishments; this was also called *salutatorium*, *parloir*, or *conference-room*. 78. 80.

AUDLEY (EDMUND), son of James Lord Audley, was bishop of Rochester in 1480, of Hereford in 1492, and of Salisbury in 1502: he built, in the cathedral churches of the two last named sees, a chapel to the Assumption, as a preparation for his own tomb: he died 23 Aug. 1524, and was buried

at Salisbury. BRITTON, *History, etc., of Hereford Cathedral*, fol., Lond., 1831.

AUGER, AUGRE, AWGRE, AUGUR, or AUGAR. (Sp. *barrena*; Fr. *tarière pointue*.) A tool used by carpenters for boring large holes. It consists of an iron spindle or rod (A), terminating at one end in a wooden handle, and at the other in a steel point like a centre bit, one of the edges being made so as to cut clean at the circumference, and the other so as to cut and take away the core for the whole length of the radius. The Society of Arts, in 1771, rewarded a worm auger, invented by Mr. Phineas Cook. *Transactions*, i, 38, 320; and in 1801, another for boring into peat, xix, 168. A detailed account of the mechanism for manufacturing what is called a single twist augur, which is usually made of a rod of metal twisted round a cylinder into a helical curve, specified in Palmer's patent, enrolled Sept. 17, 1845, is given in the *Civil Engineer Journal* for 1846, p. 16. B, represents the auger now generally used; and C, that known as a screw auger.



AUGMENTATION OF COST. The case in which the expense of a building to be paid for by "measure and value", may exceed the most careful estimates, in consequence of variations in the prices of labour or materials; in some cases clients have made compensation in consequence of such variations, although the works were executed under contracts. EXTRAS.

AUGENUPELAH. The native name for a wood of Timmely, East Indies, of a brown colour, used for general work. 71.

AUGSBURG (the ancient AUGUSTA VINDELICORUM). The capital of the province of Swabia in Bavaria. It has ten gates, of which four are principal, the others being mere entrances through the walls; one of the posterns, called Alte Einlass, is a curiosity. The town consists chiefly of narrow and ill-paved streets, with large and lofty old houses, having high pitched roofs and gables, with ALLERONS and other decorations of the same style, and scrolls and subjects painted in fresco; but where new streets have been made, great attention appears to have been given to the production of effect, and some of the new places are lined with handsome edifices, and adorned with fountains. In some portions of the city the houses are painted in stripes of gaudy colours with a bad result. The finest street is an old one called Maximilian-strasse, in which there are three fine old bronze fountains.

The cathedral, erected at the beginning of the fifteenth century, on the site of a basilica, has a CHOIR at the west and east ends; it is 350 feet long, and 91 feet wide; the side aisles have twenty-four chapels, some of them highly ornamented: the portals and ancient bronze door ascribed to the year 1048 deserve notice. The church of SS. Ulric and Afra, 1467-1499, (the choir begun in 1500, under Burkhard ENGELBERGER), given by KALLENBACH, *Baukunst*, fol., Munich, 1847, stands in such close proximity to a modern Lutheran church, as to seem almost under the same roof; its celebrated tower is said to be 350 feet high; and the church itself is 310 feet long, and 95 feet wide; the convent formerly attached to it is now converted into barracks. HERTZFELDER, *Basilica S. Udalrici*, etc., fol., Augsburg, 1627. Two of the altars are about 75 feet in height. There are altogether fifteen churches, of which five belong to the Protestants.

The *hôtel de ville*, considered to be the finest civic palace in Germany, was erected in 1620, of the Italian architecture of that period, from the designs of Elias Holl: it contains the Golden Hall, 110 feet long, 58 feet broad, and 52 feet high, richly decorated, without pillars, and having three stories of windows. Adjoining the town hall are the Perlach tower, a lofty belfry with about 500 steps, and the armoury.

Among the other public buildings, the most important are the *Schloss*, or episcopal palace, now used as government offices; the *halle*, which is a handsome commercial mart; the exchange; the theatre; the public library; the picture gallery; the *École des Arts* was placed about 1835 in the building that was

formerly the convent of S. Catherine, built 1230-1239; the polytechnic institute; the lyceum; and seminaries, gymnasia, and other schools upon a very extensive scale, and the cannon foundry in the arsenal: the Fuggerei, which is a distinct quarter consisting of 100 houses let at low rents to the poor, and other institutions, monastic as well as secular and charitable, would occupy a large space for their enumeration. The present inn of the "Three Moors" previously to 1722, was the mansion of the eldest branch of the Fugger family: part of the original house, temp. Charles V, still exists, viz. the famous room in which Charles V was received; the rest dates from 1690. Sanitary arrangements are carried out to the fullest extent: water is supplied gratuitously and plentifully to all the courts and alleys, and by a forcing apparatus it can be sent to the tops of the buildings. The suburb of S. James is a handsome portion of the town, situated outside the walls. *Basilica des Klosters S. Ulrich*, etc., fol., Augsburg, 1712. W. H. AUGUSTA ASTURICA. The ancient name of ASTORGA in Spain.

AUGUSTA AUSCORUM. The ancient name of AUCH in France.

AUGUSTA BAGIENNORUM, or VAGIENNORUM, now represented by BENE in Piedmont, exhibits the remains of an amphitheatre, aqueduct, baths, and other Roman buildings, scattered over a considerable extent of ground. DURANDI, *Delle antiche città di Pedona, etc., e dell' Augusta de' V.*, 8vo., Torino, 1769. MILLIN, *Voyage en Piedmont*, 8vo., Paris, 1816, ii, 50.

AUGUSTA EMERITA. The ancient name of MERIDA in Spain.

AUGUSTEUM. A court, or *proaulia*, in front of the atrium or courtyard of the church of Sta. Sophia at Constantinople: so called, because in it the Emperor Constantine placed a statue of his mother on giving her the title of Augusta; it afterwards held a statue of Theodosius, placed on a column, and still later an equestrian statue of Justinian. 51.

AUGUSTA JULIA. One of the ancient names of CADIZ in Spain.

AUGUSTA PRÆTORIA. The ancient name of AOSTA in Piedmont.

AUGUSTA RAURACORUM. A Roman town now represented by the two villages called AARGAU-AUGST and BASEL-AUGST, in Switzerland, which are connected by a bridge over the river Ergolz, near its junction with the Rhine. The remains of an aqueduct seem to have led to the discovery in the sixteenth century of the foundations of several houses, as well as of the amphitheatre for six thousand spectators. In pl. xcix, fig. 1, is a section of the hypocaust and of one of the chambers of thermæ, from a drawing made at Augst in 1803, by M. Aubert Parent. SCHOEFFER, *Alsatia Illustrata*. W. H.

AUGUSTA SUSSIONUM. The ancient name of SOISSONS in France.

AUGUSTA TAURINORUM. An ancient name of TURIN in Piedmont.

AUGUSTA TREVIRORUM. The ancient name of TRÈVES or TRIERS in Prussia.

AUGUSTA TRINOBANTUM. One of the ancient names of LONDINIUM or LONDON in England.

AUGUSTA VAGIENNORUM. A town now represented by BENE in Piedmont.

AUGUSTA VINDELICORUM. The ancient name of AUGSBURG in Bavaria.

AUGUSTINIAN BUILDINGS. The Eremitic Friars of the order of S. Augustine enjoyed so little wealth before their regulation in 1256 by Pope Alexander IV, and in 1287, that the buildings which the order occupied do not seem to have acquired, before the end of the fourteenth century, any very considerable variation from the early pattern of a monastery, except that one branch of the order, being particularly devoted to the service of the sick poor, had established a large number of their charitable institutions in the great towns of Europe.

The garden wall generally therefore enclosed large vaulted wards, sometimes divided by columns, with a porch at one end and a chapel at the other extremity; the apothecary and other conveniences; and the cells, refectory, kitchen, etc., of the permanent inhabitants; with the cloister and a church. The churches generally consisted of a nave only, or at most of a nave with aisles, and had neither transepts, radiating chapels, nor towers. *LE ROY, Castella, etc., Brabantie*, fol., Antwerp, 1696, gives a perfectly complete example of these establishments in the monastery of "Sta. Maria Viridis Vallis, vulgo Grœmendel", near Brussels. 10.

AUGUSTOBONA. One of the ancient names of *TROYES* in France.

AUGUSTODUNUM. One of the ancient names of *AUTUN* in France.

AUGUSTODURUS. The ancient name of *BAVEUX* in France.

AUGUSTOMAGUS. The ancient name of *SENlis* in France.

AUGUSTONOMETUM. One of the ancient names of *CLERMONT* in France.

AUGUSTORITUM. The ancient name of *LIMOGES* in France.

AUGUSTUS, TEMPLES to. Besides tolerating private superstition, of which he might be the object, Augustus permitted some of the provincial cities to erect temples to his honour, on condition that they should associate the worship of Rome with that of the sovereign. Remains of such temples exist at Ancyra (*TEXIER, Descr. de l'Asie Mineure*, fol., Paris, 1849); and at Puteoli (*MAZZELLA, Antichità di Pozzuolo*, 8vo., Naples, 1606); another at Vienne in France, presumed to be dedicated to Augustus and Livia, is now formed into the Museum of Antiquities. *TAYLOR and NODIER, Voy. Pitt. Dauphiné*, fol., Paris, 1843. At Lyons was a celebrated altar erected in honour of this emperor by sixty of the neighbouring tribes, each of whom was represented by a statue that formed part of the decoration of the fane.

AUL, see AWL.

AULA or AULE (Gr. αὐλή). This term originally designated an area, open court, or yard in front of a Greek house, around which the stables and other out-buildings were placed; but in later times it was used for one or more courts, or halls, in ancient Greek houses, corresponding somewhat in intention and use with the cavædium, atrium and peristyle of a Roman mansion. The *ANDRONITIS* and *GYNAEONITIS* each had at least one such court, when both suites of apartments were on the same level. The aule or court of the andronitis was a space open to the sky in the centre (*hypæthrum*), and surrounded on every side by porticos (*stoa*), of which one, probably that nearest to the entrance, was called *prostoon*, *PLATO, Protag.* These porticos were used for ambulatories and dining-rooms, and held the altars of the household gods, and of Jupiter Herkeios. *VITRUVIUS*, vi, 7, adds that the porticos of the peristyle were of equal height, or else that the one facing the south was built with loftier columns than those of the other porticos; in this last case it was termed a Rhodian peristyle. Round the aule were apartments appropriated to various purposes. It had a communicating passage (*mesaulos*) leading to the aule or court of the *gynaecitis*, which differed from that of the andronitis, in having porticos on three sides only: on the side facing the south, according to *VITRUVIUS*, or opposite to the *mesaulos*, were placed two ante, marking the boundary of the *PROSTAS* or *PANASTAS*. Round this aule were the bedrooms, storerooms, and other apartments in common use. 23. 78.

BATISSIER, Hist. de l'Art, p. 190, says that the aule of the *gynaecitis* seems to have been lighted through a circular hole, αὐγή, in the middle of its roof; but this statement is open to many doubts: *HOPE*. The Romans called the central portion of the scene in their theatres *aula regia*, as representing the royal residence (*VITRUVIUS*, v, 7); whence *aula* is generally used by classic Latin writers for the court, in its sense of palace.

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AULA also was used both by the Greeks and Romans for the natural or artificial place in which animals were lodged, as a cave, a stable, a pen, etc. The word seems also to have been applied to the spaces within the barriers, *septa*, which broke the crowds in the Roman temples and basilicas. 49.

In Greek Christian architecture, the words *aula* and *atrium* were equally applied to the enclosed area in front of the basilica, though *aula ecclesiæ* seems to have meant the nave; the later Latin writers adopted the term *aula* for a hall or vestibule, a market place (Fr. *halle*), and an open *place* or area; in *Domesday Book*, it generally means a hall-house or manor-house. *SALAMANCA*. 19.

AULÆA or AULÆUM (Gr. αὐλαία). The hangings used to decorate the walls of apartments, *HOR., Sat.*, ii, 8, or as a screen between the pillars of a porticus, *PROP.*, ii, 23, colonnade, or pillared hypæthral atrium. The word is also used for a *DROP SCENE*; *SIPARIUM*. The application of the name is shown by *SERVIVS* and *VARRO* to have arisen from the existence of such articles of luxury in the *aula* or palace of *Attalus*, king of *Pergamus*, when the Roman people, as his heir, took possession of his treasures. 49.

AULEOLUM. The late Latin term for a small church or chapel. 19.

AULTER, AULTERE, AUTER. Old forms of the word *ALTAR*.

AUMBREY. Modern lexicographers have almost agreed to treat this word as a corruption, through *awmbeury*, from *ALMONRY*; in which case it was the popular name for a portion of the precincts of Westminster Abbey; but the easily traced connexion through *ambry* and *almarior* with *ARMARIUM* oppose that view of its origin.

AUNDHYRYN. An old English form for *ANDIRON*.

AUNE. A French measure of length. *ELL.*

AURI-PIGMENTUM. The Latin name for a yellow pigment made of the sulphuret of arsenic, commonly called *orpiment*.

AURUNGABAD. A village until 1634, but afterwards the chief city of the province of the same name but formerly called *Ahmednuggur*, in the Deccan or Western Hindostan. The walls, having round towers of little strength, which are about seven miles in length, enclose a space laid out with great attention to regularity. A full supply of excellent water is conducted from the neighbouring hills in stone channels, and distributed through earthen pipes into the town, where ornamental stone reservoirs are placed to receive it for public use. The principal street is about two miles in length, with four rows of trees, and terminates at one end in a spacious quadrangle. The houses, all having terraced roofs and chiefly standing among groves of fine trees; the caravanserais; the two bridges connecting the city with its principal suburb, called *Begumpoorah*; and the few remaining public buildings and government offices, which are all of white marble, like the mosques and tombs, are well built, but are not thought equal in beauty to those of *Agra* and *Delhi*. The palace of *Aurungzebe* is in ruins; but the tomb of his daughter, built in imitation of the *Taje-mahal* at *Agra*, still stands conspicuous among the white domes and lofty minarets of the mosques. W. H.

The *BUILDER, Journal*, ix, 776, contains an account of three groups of rock-cut caves, situated about half an hour's walk to the north of *Aurungabad*, which contains eleven caves scattered over a space of about a mile and a half. The locality is marked by a small Jain cave, which is still in use; the others are *VIHARA* or monastic caves, accompanied by the usual *DAGHOPA*. An arrangement seldom found in Buddhist excavations, but frequent in *Braminical* and *Jain* caves, is adopted in one of these groups; the *sanctum* being isolated from the external wall by a passage going round it, containing the cells and other chambers. The ornamental carving is said to be an exact counterpart of that at *ELLORA* and *Ajunta*. (*FERGUSSON, Illustrations*, Lond. 1845, pl. 3-9, p. 15.) The character of the second group of caves is also Buddhist. The third group con-

sists of three caves, all of which have been left in an unfinished state.

AUSCULTANTIUM LOCUS, see LOCUS.

AUSIDUA, see ASSIDUA.

AUSOLA IBARGUEN (IGNACIO DE) made, in 1646, designs in competition against Francisco de Issasi, for the chapels and towers of the parish church of the town of Eybar, in the province of Guipuzcoa in Spain: the work was executed by Juan Ausola, son and pupil of Miguel de Ausola, and finished in 1662. 66.

AUSTIN (GEORGE), born at Woodstock, was the earliest of those who called attention to the restoration of English cathedrals. Being appointed about 1820 resident architect of that at Canterbury, he found the main fabric of the building in a very dangerous state, and works of an extensive nature were considered immediately necessary to save it: many ingenious methods were adopted to overcome difficulties, amongst which were forcing nearly all the walls into an upright position; resetting the groined arches of the south-eastern transept, and also the unique Norman circular window, 17 feet in diameter; and rebuilding the Norman gable; thus restoring this transept to its former beauty. In like manner the groining of the choir was saved and restored. The Norman tower at the north-west angle having for a long time been gradually falling, and endangering the groining of the nave, he strained the walls of the nave into an upright position, raised the crippled groining, and designed and erected the present tower.

After the removal of the whitewash, all the stone work was refaced, and the innumerable small purbeck pillars were restored with a composition made by him; the beautiful crypt under the choir and chapels was restored to its former beauty; the bosses and ornaments of the roof and tower were gilded and painted; drawings were made of the half-destroyed wall paintings; the stained and painted glass windows were restored, and some portions filled up with new glass, executed by himself. The old carved and painted organ was removed, and the view opened from west to east; the oaken screen and altar-piece around the choir were removed, and the beautiful screen of Henry d'Estria brought to light and restored; the present altar screen was then erected from his designs, preference being given to a style which would not conceal the unique view beyond it. In preparing the foundations, the remains of the ancient high altar and jasper pavement described by GERVAZE as being destroyed in the fire of 1174, were found, and this pavement still surrounds the high altar, which was removed to its original position.

The archbishop's throne (illustrated in the *BUILDER Journal*, vi, 138) was the last addition by him, shortly before his death, 26 October 1848, aged 62. He was buried in a vault constructed for the purpose under the north-western tower, where his services are recorded by the Chapter on a bronze tablet. A more detailed account is given in the *BUILDER Journal*, vii, 206.

AUSTIN'S ARTIFICIAL STONE. A composition invented by Mr. Austin, of the New Road, London, for the manufacture of architectural ornaments, figures, etc., used in the external decoration of houses, and for garden embellishments, about the year 1814, when Roman cement formed the chief ingredient; Atkinson's cement was employed about five years later; and about twenty-five years since Portland cement was adopted, which material is still used by his successor, Mr. Seeley.

AUTHORITY. The power and credit delegated by a principal to his agent, which must be in writing for the purposes of making leases and other acts specified in the first three sections of the Statute of Frauds, 29 Charles II, c. 3, and by deed if the agent is to bind his principal by the legal instrument so called, or if he is to act (except in some ordinary purposes) for a corporation; in other cases a verbal appointment is sufficient. The authority, besides being generally revocable, ceases upon the death, insolvency, or bankruptcy of the principal or agent. An

agent's authority is said to be limited when he receives precise instructions, and unlimited when he is not so bound: his powers, if not specially restricted, are implied by the custom, local or professional; it being considered his duty to act in conformity with what may be reasonably deemed the intentions of his employer, and where these cannot be known, then in conformity with the interest of his principal, with the discretion of a prudent man engaged upon his own affairs.

An authority is always understood as including all necessary or usual means for giving it effect, and the agent has therefore the power of doing all subordinate acts, either requisite in law to the performance of his instructions, or necessary to effect it in the most fitting manner, or usually incidental in the course of business. An agent has no right to commission for doing any act not warranted by his authority, either expressed or implied, or if he does an act within his authority, but with such negligence or unskilfulness that no benefit accrues from it. If (except in urgent cases) he exceeds his authority, he incurs the risk without sharing the profit. The principal may reject what has been done, provided he decides immediately on his knowledge, and gives notice to his agent in a reasonable time; for otherwise he is presumed to have adopted it. An agent is also entitled to the reimbursement of advances made on behalf of his principal, if they are justified by an authority, either expressed, implied, or sanctioned; for cases sometimes occur of extreme danger, or under circumstances not occurring in the usual course of business, without any means of referring for instructions to the principal, in which the agent, as acting for the best, is not only justified but expected to act without particular directions. An authority confers upon the agent a particular or general LIEN; and upon third parties the safety of what is called an apparent authority. This apparent authority is presumed from the previous employment of the agent, or from the conduct of the principal, until it is known or may reasonably be presumed that the authority has ceased; and equally with any other form of authority binds the principal as to any agreements, contracts, notice, statement, or evidence, whether to his advantage or disadvantage; and though the principal may have limited the authority by express instructions, he is not discharged thereby from obligations incurred in the ordinary course of business to persons who may have dealt with the agent in ignorance of such a limitation, the agent only being responsible to the employer for exceeding his authority; but in the case of a special authority to do certain acts, those who deal with an agent are bound to learn the extent of his authority. An authority generally absolves the agent, but fails him in most respects if he exceeds it, or binds himself by his own express undertaking, or conceals his principal, or if a principal be not known, or there be no responsible principal to apply to, as a committee, or commissioners not incorporated, or if credit be originally given to him and not to the principal. An authority cannot be delegated by the agent, unless by a custom, as of an architect employing a surveyor; but he may employ others to perform his engagements, becoming answerable for them to his employer, but not to third parties for more than his own acts, and such as are done by his direction. WATSON, *Treatise on the Law of Arbitration and Awards*, 3rd edit., 8vo., Lond., 1846. T. T.

AUTHORITY is a precedent drawn from the practice of those masters whose attainments or productions are of sufficient acknowledged merit to warrant the acceptance of their data as evidence of the existence and application of some principle not clearly perceptible or absolutely recognized. This authority should only be received, *quantum valeat*, in the absence of a better test, and should be followed only in cases clearly parallel or identical, where no well known principle is violated, and with mature consideration of the circumstances under which it was originally employed; in fact, with the exercise, not with the surrender, of private judgment. AUTHORITY has been used by some writers for PRECEDENT, in which case it was improperly applied.

H. B. G.

AUTISSIODURUM or AUTESSIODURUM. The ancient name of AUXERRE in France.

AUTISTATES is sometimes found written in manuscripts for ANTISTATES.

AUTRICUM. One of the ancient names of CHARTRES in France.

AUTEE. The native name for a wood of Tinnevely, East Indies, of a red colour, used for furniture. 71.

AUTUN (the Latin AUGUSTODUNUM). An episcopal city in the department of the Saône and Loire in France. Many curious fragments of the ancient walls, which were of stone beautifully jointed without cement, and flanked with towers at irregular distances, are still traceable for a circuit of about three miles; there are also several other Roman remains, including two very fine gateways, improperly called triumphal arches. The



Porte d'Arroux

porta Senonica, now called the *porte d'Arroux*, also built of stone without cement, is about 55 feet 6 inches high, and 62 feet 4 inches wide, having two large archways separated by a central pier, and beyond them two smaller archways for foot passengers; above these is an entablature carrying an attic of Corinthian fluted pilasters on the piers of an arcade, which was never finished on the inner or city side; seven of its arches only remain. The capitals of the pilasters inside this gallery are only boasted, not finished; the grooves in the arches beneath for portcullises to be drawn up into this gallery are still visible, as in another case at Verona. The *porta Ligonensis*, or *porte S. André*, is similar; but the pilasters, though called



Porte d'Arroux.

Porte S. André.

by some travellers Ionic, rather belong to a Composite order: the small arches pierced two projections or wings on the outer side, one of which is destroyed; the other serves to form the chapel of S. André: the architectural ornaments of both *portes* are well sculptured and in good preservation. There are also the ruins of a theatre; of an amphitheatre; of a round building called part of the *thermæ*; of a square tower assigned to a temple to Minerva; and of another supposed to have formed part of a temple to Cybele, but which afterwards was a tower common to the abbey of S. Jean, and the parish church of the same name: there are also some ruins which antiquaries have dedicated to Apollo. All these are within the walls. Beyond these precincts there are vestiges of a naumachia and its aqueduct, and of a square tower about 50 feet high, of which three sides remain, said to have been a temple dedicated to Janus. The Roman bridge over the river Tarenai, crosses the stream at a right-angle, with ten semicircular arches of 17 feet span, and piers half that width in thickness, and returns to the right up the valley with eight semicircular arches about 11 feet wide and piers about 5 feet 6 inches thick, so as to allow the waters to escape when the river overflows its bank. South-east of the town is the *pierre de Coulard*, or *Coulhar*, or *Couar*, said to be the monument of Divitiacus, which is a pyramidal mass of rough

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rubble, united by a white and very hard cement, and about 42 feet wide at the base of each side, and nearly 50 feet high. Autun was refounded by Diocletian.

The cathedral, dedicated to S. Lazare, is described by BOURASSÉ, *Cathédrales de la France*, 8vo., Tours, 1843, as chiefly belonging to the period of the transition from the Romano-Byzantine school to the *style ogival premier* (it was built by Robert I, Duke of Burgundy, between 1031 and 1076), while the accessory chapels and spires are in the *style ogival tertiare*. The earlier portion is certainly a close imitation of Roman art. The building suffered considerable improvements in the course of the last century. The lofty spire, 325 feet in height, with its foliated crockets, and the *jubé* or rood loft, with its elaborate and delicate enrichments, are considered the finest in Burgundy, if not in France; while the elegant decorations of the *flamboyant* chapels, the small sculptures in the chancel, choir, and nave, and the door of the sacristy, challenge attention. An entrance of modern construction preserves some curiously carved ancient columns, a zodiac, and a Doom. This church was occupied by the bishop as the cathedral on the destruction of the former cathedral, dedicated to S. Nazaire, which is in the immediate vicinity, and of which the new choir only was ever finished. Both these churches are in the quarter called the *Château*, which is presumed to be the site of the ancient citadel. The next quarter, called *la Ville*, occupies with the other two about one-fourth of the ancient city; it has good houses, and the *place de S. Lazare*, commonly called the *champ de S. Ladre*, is planted with trees, and has a fountain, given in SOMMERARD, *Album*, pl. 7, ser. 10. The third quarter, called the *Marchaux*, is supposed to be the ancient *Martiale Forum*, situated at the intersection of the two Roman roads which crossed the original city; this consists of narrow streets, with small and badly built houses. There are some remains of the ancient pavement, consisting of large polygonal blocks of granite, about 18 inches thick, *in situ*; and a considerable quantity of the blocks are scattered through the town. A theological seminary founded by Louis XIV, a *collège* or university with a good library, two hospitals, an *hôtel de ville*, a gallery of painting and sculpture, and a theatre, are the other chief buildings. Grey granite for building and paving, green porphyry, potters' clay, and iron, lead, and coal mines, which abound on the spot, render every facility for architectural and engineering works. MILLIN, *Voyages*, 4to., Paris, 1807; REICHARD, *Itinéraire*, 16mo., London, 1816; LABORDE, *Monumens de France*, etc., fol., Paris, 1816, pl. 11, 12, 32, 33, 34, 68, and 143; CHAPUIS, *Collection des Cathédrales*, 4to, Paris, 1830.

AUVANNA, see ANTEVANNA, ANVANNA, and AWNING.

AUXENTIUS, called Vir Clarissimus, of the time of Theodosius (375-408), is mentioned by SYMMACHUS, *Ep.* x, 38, 39, as an architect of a basilica and bridge, with whom Cyriades quarrelled. SYMMACHUS appointed Aphrodisius to succeed Auxentius, and Anthemius Bassus to be arbitrator.

AUXERRE (the Latin AUTISSIODURUM). A city in the department of the Yonne in France. It is generally considered to be a specimen of an old town, with many well built houses, in narrow, crooked, ill-paved, and dirty streets. The cathedral of the suppressed bishopric, dedicated to S. Etienne, would have been one of the finest specimens of the *flamboyant* Gothic style in France, had its splendid façade been finished; the portals and the rose windows, with the stained glass, chiefly mosaic in style, are magnificent. The transept walls are covered externally with flamboyant tracery, so boldly executed as in some places to stand free. The choir and its glass (both 1215-1234), however, and the caputular buildings belong to the twelfth or thirteenth centuries. INKERSLEY, *Architecture of France*, 8vo., London, 1850, dates the nave by the consecration in 1334, and the erection of a chapel about 1373; gives 1415-1513 as the period of the execution of the exterior of the north transept; and quotes two inscriptions dated in 1525 and 1530, showing the time of the erection of the north-west tower. The

church of S. Pierre is a large Italianized Gothic building, commenced at the end of the sixteenth century, and finished in 1672, with a handsome entrance gateway of the latter period. The abbey church of S. Germain, now attached to the Hôtel Dieu, belonging to the period of transition from the Romanesque to the Pointed style, contains several crypts in stories; the tower of the west front is detached, as part of the nave is destroyed, but the transepts and lofty choir still tell of former grandeur. The church of S. Eusèbe has also a detached tower; the nave belongs to the Romanesque style, but the choir, which is of the flamboyant Gothic, was begun in 1530. There are a few other churches of less importance; that of Notre Dame was collegiate. The old episcopal palace, now the hotel of the Prefecture, has been called "le plus bel édifice épiscopal de toute la France".

Besides several remains of the Roman period, Auxerre numbers amongst its principal attractions to the visitor the *tour de Phorloge*, which is a gatehouse in the market-place with a belfry and a spire of iron bars; a handsome hospital, constructed about 1830-1835; a public library; a museum of natural history; and a good collection of philosophical instruments; a *collège*; a theatre; and the ruins of numerous religious establishments, destroyed in the first Revolution. LABORDE, *Monumens de la France*, 4to., Paris, 1816, pl. 143, 144, 245, 246; CHAPUIS, *Cathédrales de France*, 4to., Paris, 1828.

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The stone of which the cathedral is built was taken from the curious grotto of Arcy, which contains a number of galleries about 20 feet in height, and some more than 1500 or 1800 feet in length.

AUXILIARY or CUSHION RAFTER. The name given to the raking piece of the truss in a queen post roof; it is sometimes called the principal brace, and is placed under the principal rafters, so as to support it when the span of the roof requires the introduction of one or more queen post trusses.

AUXIMUM. The ancient name of OSIMO in the Papal States.

AUXUME. The ancient name of AXUM in Abyssinia.

AVA, properly ANGWA or AINGWA, corrupted in Hindoo into AWAHANG and AWA, and also called RATANAPOORA. A city, founded in 1364, but chiefly rebuilt in 1763, which has thrice been made the capital of the Burmese empire. It last received this distinction in 1822, and then became between four or five miles in circumference; the brick embrasured rampart, about 15 feet high and 10 feet thick, has twenty-one gates. The north-east portion was separated from the rest of the town by a brick wall, and contained the palace, finished in 1824; the Rungdhau, or hall of justice; the great council chamber or Lutdhau, corrupted by the English into Lotoo; the arsenal; and the dwellings of the most distinguished courtiers. The remainder of the town was made up of gardens and avenues of trees, scattered huts thatched with grass, a few planked and tiled houses, perhaps five or six brick and mortar dwellings, eleven bazaars of thatched sheds, some dilapidated ecclesiastical establishments, and numerous temples, which, although touched by the hand of time, gave at a distance, with their tall white or gilded pinnacles, a splendid and imposing appearance not realized on a nearer approach. The city is only one mile distant from AMARAPOORA, or Ummerapoora, which was the capital from 1783 till 1819 or 1822. It was said that the earthquake of 1839 destroyed every building pretending to substantiality, and that the court had been transferred to Monchobo or Moksabo; but in 1853 the city was still the seat of government. CRAWFORD, *Journal of an Embassy, etc., to the Court of Ava*, 8vo., Lond. 1834; SYMES, *An Account of an Embassy to Ava in 1795*, 12mo., Edinb. 1827.

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AVANTBARIUM. A species of fortification "before the barriers", which seems to have been to a city what the barbican was to the castle. MEYRICK, *Anc. Arm., Glossary*, iii.

AVANTURINE, see GLAZE.

AVEBURY, ABURY, or ABRY. A village and parish about six miles from Marlborough in Wiltshire. The valley of the

river Kennet, north of the high road from Marlborough to Calne for a length of about six miles, appears to have been occupied by numerous and scattered remains, which include Silbury Hill, the largest *tumulus* or barrow in Europe, and the village itself, which stands within the enclosure of the site of what was once the most interesting and extensive CELTIC or DRUIDICAL MONUMENT also in Europe, especially as an example of an union of the two forms of idolatry, the sun and the serpent. It consisted of not less than 650 unhewn blocks of oolitic sandstone, selected from similar masses laying near the high road, and included two avenues, each extending for upwards of a mile, being a peculiarity distinguishing this work from all other Celtic remains; but only thirty-five of these stones existed in 1814. STUKELEY, *Abury*, fol., London, 1743; GAILLIABAUD, *Ancient and Modern Architecture*, 4to., Paris and Lond., 1852, vol. i; HUNTER, *Present State*, given in GENTLEMAN'S MAG., vol. for 1829, ii, 5; PENNY CYCLOPEDIA, s. v. *Avebury*; HOARE, *Ancient Wiltshire*, fol., London, 1810-21; ASSOCIATED ARCHITECTURAL SOCIETIES' Reports, 8vo., London, 1854, ii, 414.

AVEIA. The ancient name of FOSSA in the kingdom of Naples.

AVEIRO or BRAGANÇA NOVA. A city in the province of Douro in Portugal. The entrance to the mouth of the river Vouga, which flows past it, is marked by two stone pyramids, each 70 feet in height. The town contains a cathedral, four churches, six monasteries, an hospital, and a *collège*.

AVELLINO. A city in the province of Principato Ultra, in the kingdom of Naples. It consists of broad irregular streets, with a mean cathedral dedicated to the Assumption, three parish churches, and six convents; the other public buildings, consisting of the episcopal palace, two schools, the courts of justice, and the residence of the governor, are not of much architectural importance, the large public granary being superior to them all.

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AVENCHES, in Switzerland. The modern name of AVENTICUM.

AVENIO. The ancient name of AVIGNON in France.

AVENTICUM. The ancient name of Avenches, otherwise called Wefflisburg, in the canton of Vaud in Switzerland. Remains of the Roman walls, which were some miles in circuit, of an amphitheatre, aqueduct and bath, with a tower, and a column 37 feet high, are visible. The modern town contains a castle, an old church, and a lunatic asylum.

AVENUE (Sp. *avenida*; Fr. *avenue*). A generally straight road, walk, alley, or path, bordered on each side with a repetition of objects of similar types. Thus the term is equally applicable to ranges of artificial and natural objects. The approaches to Avebury, the dromos with the ranges of sphinxes at the Egyptian Thebes, the colonnades at Palmyra, and the rows of fountains at Versailles, are simply variations of the feeling for regularity and uniformity which is coincident with the first stages of civilization, and which has perhaps never so decidedly manifested itself as in the employment of long parallel lines of trees, of which there are innumerable examples in the approaches to the great cities of continental Europe. In England, the Long walk at Windsor is perhaps the best example of the use of such means in forming an approach; but the tedium which the continental examples inspire is avoided by the fortunate undulation of the ground: the chestnut trees in Bushy Park may be named as another approved instance.

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In the formal system of gardening, which this country derived apparently from the French and Italians, avenues were almost the only features of importance; and they were always formed by regular alignments of trees or tall shrubs. It was a rule that 60 feet was the least width for an avenue to a point or prospect, but that where it led to a building the walk should not be less wide than the front of the edifice: this was misunderstood or misapplied, for many avenues were planted on lines drawn to the flanks of a façade, so that when the trees were grown their branches concealed all but a part of the basement.

The modern improvement has been to plant platoons, as they were once called, or clumps of several trees, consisting of groups of trees at about 300 feet apart, the trees being 30 feet from each other, if the length of the path will allow it; otherwise single trees are preferable. The English elm, the rough or smooth Dutch elm, the lime, the horse-chesnut, the common chesnut, the beech, and the abele, have generally been preferred for such avenues. 13.

AVERICUM. The ancient name of BOURGES in France.

AVERLINO, AVERULINO, or AVERRULINO (ANTONIO), or ANTONIO DI FIRENZE, commonly called Filarete, was a young man in 1431, and died aged sixty-nine, after 1464. VASARI, in v. Filarete, states that Antonio, with Simone the brother of Donato, both Florentine sculptors, were selected by Pope Eugenius IV, 1431-1447, to execute one of the doors for S. Peter's at Rome in bronze, and that when it was completed Antonio was invited to Milan, where he executed the great hospital (Albergo de' Poveri di Dio) after his own design, which has been attributed improperly to Bramante. The first stone was laid 12 April, 1457. The building has been subsequently much altered. The principal church or *duomo* of Bergamo was likewise a work of Antonio, but being considered too small, the construction of it was suspended after some time, but was completed by Carlo Fontana. A manuscript work on architecture, in twenty-four books, dedicated to Piero di Medici in 1464, by Averlino, is now in the Libreria Magliabecchiana, and another copy, dedicated to Francesco Sforza, is in the Biblioteca Palatina at Florence.

AVERRHOA CARAMBOLA. A beautiful evergreen tree in Hindostan, the wood of which is used for furniture, etc. *Hewa Nien* is the name given to it in China. 71.

AVERRULINO or AVERULINO, see AVERLINO.

AVERY. A place where oats are kept as provender for horses. 4.

AVERSA (the ancient Atella). A city in the province of Terra di Lavoro, in the kingdom of Naples. The cathedral, dedicated to S. Paolo, with a tower 300 feet in height, was commenced in the time of Pope Leo X (1513-1522). The eight churches; several convents, one of which occupies the site of a Norman castle; two palazzi; a tribunal; a founding hospital; and the avenue to Naples, which is nine miles long, are generally less interesting to visitors than the admirable lunatic asylum, established by the philanthropist Linguisti, which was a model for that at Palermo, and for many English and other places of a similar character, he having introduced a kind, ingenious, and lively treatment of the patients, by allowing them congenial pursuits and amusements. W. H.

AVIARIUM or AVIARY. This term originally meant a place for waterfowl, COLUMELLA, viii, 1; and afterwards for any birds meant for food, PLINY, x, 72: the term ORNITHON being appropriated to the large cage in which rare and singing birds were kept; the first of this sort was constructed for Marcus Lanius Strabo at Brundisium, in the first century B.C. VARRO, iii, 5, gives a minute description of his own ornithon. The Roman aviary was a building with high walls and an arched roof, having a few small windows, and rows of shelves as roosting places for the birds, sometimes a thousand in number, approached by chicken ladders, *pertice*, or perches, *pali*; with one room attached where the birds were prepared for market, and another as a sort of *morgue* for the reception of those which died between the periods of taking accounts of the stock. The modern aviary is far different, and may be considered as intended for birds of song, and for birds of show. It is evident that no person with good taste would recommend the confinement of many birds of the same or different song in one cage, or within sight of each other: should such an aviary be desired, however, it would resemble one for exotic birds of show. Lucullus, in his Tusculan villa, had a triclinium within or surrounded by the ornithon: this must have been effected by latticed separations, in default of the

modern glass partitions; yet even these require wirework to prevent damage to the glass, as a sparrow has been known to break through a sheet of plate glass. *Scriptores Rei Rusticæ*, Leipsic, 1773; J. A. DE SEGNER, *De Ornithone Varronis*; GOLFFON, *Observations sur la Volière de Varron*; HIRT, *Dissertation sur la Volière de Varron à Casinum*, to which there is a reply by RODE, *Recueil de Mémoires concernant l'Architecture*, 1800, with a counter-statement by HIRT; STIEGLITZ, *Archéologie de l'Architecture*, pl. 36, pp. 274-28. An article entitled "Gallinacæ" in FRASER'S MAGAZINE for May 1854, contains some admirable references to ancient and modern aviaries. ELMES, *Dict.*, s. v., mentions aviaries at Woburn Abbey and at Goodwood in England, and at Malmaison in France, as specially worthy of notice: and as an aviary forms an essential feature in all zoological collections, it may be presumed that such institutions as the Zoological Society of London, and the Jardin des Plantes at Paris, contain the best examples of enclosures for fowls. Show birds, when placed in the open air, are best confined in rustic or other light structures, with netting strained over plain or ornamental standards covering the yards, and the site should be often changed, unless the water be a pond with a running stream, when a change is not so important. Exotic birds are placed in buildings glazed on two sides, sometimes artificially heated, having windows fronting to the south, the whole or part of the roof of glass, and a complete lining of wire network. To prevent the appearance of dirt and litter, the birds are taught to find food and water in a chamber below the floor of the cage. The system of making the aviary an internal portion of a conservatory has been abandoned, in consequence of the rapid decomposition of brass wire network in such situations: but an aviary may be attached externally, with an effect of life and animation even more pleasing than that derived from flowers.

AVICENNIA NATIVA. A native tree of British Guiana, of surprising rapidity of growth, giving a diameter of 5½ inches in five years. The wood (*courida*) is open grained, moderately soft, and rather light. It is perishable when exposed to the atmosphere, but is very durable under ground; it is therefore used in foundations for buildings. A. tomentosa (*mangle blanco*) is a native wood of Cuba, used for building, furniture, etc. 71.

AVIGNON (the Latin AVENIO). A city in the department of Vaucluse in France. The plan of it is oval surrounded by battlemented walls flanked by square towers. Some handsome gates lead into narrow, ill-paved streets, full of antique and well built houses. The only Roman remains are a single archway, built of large blocks of MOLASSE, in a small street leading out of the *rue de la Fusterie*, which may have belonged to a theatre or a conduit; and a semicircular arch between two columns of a Corinthian order, in the front of the cathedral, which according to local antiquaries once formed part of a temple to Hercules.

The *place du Palais* contains a singular collection of edifices. Among them are the cathedral; the archiepiscopal palace, dating from 1318; and the new *hôtel de ville*, once a guard-house, but originally the papal mint, built in 1610, having a façade curiously crowded with stone festoons of large fruit, lions' heads, and gigantic griffins.

The *place de l'Horloge* contains the old *hôtel de ville*, a semi-Gothic building, formerly the palazzo Colonna, overlooked by a *beffroi* of remarkable construction; and the theatre, built in 1824.

The *place Pie* contains the *halle aux grains*. In the *place de la Pignotte* are a church with a circular sanctuary, very beautiful in effect, and the fine and grand church of the Jesuits, their college is on the opposite side of a street, over which the connecting bridge was built in a single night, to obtain the advantage of possession against the local building regulations.

The cathedral, dedicated to Notre Dame des Doms, or de Dominis (from a rock so called, which rises abruptly from the

Rhone to a height of 180 feet), has a nave in the *style Romano-Byzantin*, with a fine portal of the eleventh century, and a massive western tower. The choir and octagonal dome at the transepts are modern, with fluted Corinthian columns: the vaulted roof with pointed arches, the altar-screen, altar, and papal throne are objects of interest. The chapel of the Resurrection, executed in 1680, is considered a *chef d'œuvre* of sculpture; the other chapels date from the fourteenth century.

The church of S. Martial has some pointed windows of a good style of workmanship at the east end, one with tracery to resemble *fleurs de lis*; and a cloister of the sixteenth century. The church of S. Pierre was rebuilt in 1358; the façade, built in 1512, at a cost of 1800 golden crowns, is a very rich and pure specimen of French Gothic architecture, nearly resembling the English Perpendicular style: it is unfortunately much mutilated; the pulpit is worthy of observation. The church of S. Agricole is also considered interesting, on account of its south doorway and magnificent altar-piece, both in the *style de la Renaissance*. The church of S. Didier contains a beautiful Gothic pulpit corbelled out from the wall. In the *rue de la Calade* were the circular church of the Oratorians, and the church of the Dominicans, which was the largest in Avignon, but both were condemned to destruction in 1846, and have probably been demolished accordingly: the nave of the latter was then occupied by the *fonderies de Vaucluse*, which had a fine portal decorated with two *rostra*. Great part of the 100 monastic establishments have been applied to lay purposes: the *hôtel de la Mule Blanche* was once a fine church. The Benedictine monastery, next to the church of S. Martial, now contains the museum of natural history: and the *hospice*, or rather *hôtel des Invalides*, for 1500 in-patients (which is the only other one in France, being an adjunct to that at Paris), consists of the buildings of two ecclesiastical establishments separated by a garden, one was the convent of S. Louis, and the other the monastery of the Celestins: the chapel of S. Louis has a fine Gothic choir, with a curious vaulted ceiling: the monastery of the Celestins was famous for its library, and the tomb of S. Benezet.

The papal palace, commenced in 1316 or 1319, has walls 100 feet in height, with towers, some of which have another 50 feet. It is a mixture of the monastery and the feudal castle, and is altogether a remarkable building: the Inquisition had a "question-chamber", the walls of which contracting the space as they rise like an inverted funnel, are said to prevent the escape of sound, and present a curiosity in acoustics. This edifice is now partly in ruins, partly occupied as a barrack and prison. The grand staircase has a continuing groin; the great hall is now divided into several stories of dormitories, but the groining and shafts remain. An interesting article on this building is inserted in *La France Catholique*, p. 167 b.

The archiepiscopal palace, and that of the *podestà* or governor, are probably of the same period as the above palace. SOMMERARD, *Album*, 4th series, pl. x. Among the other public buildings are, a little gem of a theatre by Mignard in the *place de l'Oule* or *d'Oulle*, now converted into a shop; the *hôpital de Ste. Marthe*, having a magnificent façade; the *musée Calvet* of antiquities, and the public museum of pictures and books, in the *hôtel Delcambre, rue Calade*; the lunatic asylum and its chapel, formerly belonging to the *Penitens de la Miséricorde*; the *collège royal*; the *athénée*; the public museum of art and natural history, once a Benedictine convent, containing a large collection of Roman glass found at Vaison; two *hospices*; and the Savoyard school.

The suburb called Villeneuve les Avignons, approached by a suspension bridge erected about 1845, contains many remains of monastic establishments, exhibiting architecture in the Pointed styles: among them is the church, dating from the fourteenth century; the tomb of Pope Innocent VI, one of the finest specimens of the sculptured architecture of the same century, which has been repaired and removed to the chapel of the hospital; the almost unaltered Gothic fortress of S. André;

the ruins of the Gothic church of the Chartreuse, built 1285-1314; and a tower (once forming the *tête du pont* of the nearly destroyed bridge with a chapel of S. Benezet) faced with stones cut into diamond facets.

FROSSARD, *Tableau, etc., de Nîmes, etc.*, 8vo., Paris, 1846; TAYLOR and NODIER, *Languedoc*, vol. ii, pt. 2; GAILHABAUD, *Ancient, etc., Arch.*, 4to., London, 1852, vol. iii; LABORDE, *Monuments de la France*, fol., Paris, 1816, pl. 120 and 167.

AVILA DEL REY (the ancient ABULA). A city in the province of the same name in Spain. It is one of the most interesting of the cities in that kingdom, not only on account of its walls (which are 14 feet in thickness, and consist of a rubble or concrete filling between two faces of granite masonry polished by the weather) built by CASSANDRO and FLORINO de Pituenza, 1090-1098, but of the interior decorations of the public buildings. The streets are irregular, narrow, and badly paved, having no channels or drains; the houses, which are generally one story in height, are built, like the principal edifices, of dark grey granite. The cathedral, dedicated to S. Salvador, was built by Alvar Garcia of Estella, 1091-1107: it resembles some other ecclesiastical edifices in Spain of the same period, in having been built to serve for a fortress as well as a church; it possesses two fine chapels, some good bronze railings, painted glass dated 1498 and 1520, and the carving to the stalls, belonging to the years 1536-1547. Among the churches, those of S. Jose and of the Dominican convent, with some exquisitely carved stalls, and those of S. Salvador and of S. Vincente, are the most remarkable, though all are deserving of inspection. The Dominican convent of S. Tomé, with its atrium, church, four quadrangles, the old *Universidad* (constructed in 1794, and suppressed in 1811), and all the other buildings, even including granaries, necessary to a complete monastic establishment, was one of the nine or ten convents, etc., which have been suppressed, but whose churches still deserve examination. Besides the public establishments, there are several private buildings of considerable importance to the student. ARIZ, *Historia de las grandezas de la Ciudad de Avila*, fol., Alcalá, 1607. 85.

AVILER (AUGUSTIN CHARLES D') of a family originally from Nancy, was born at Paris in 1653, and having made considerable progress in his studies, was nominated in his twentieth year a pupil in the French Academy at Rome. He left Marseilles in company with Desgodetz, at the end of 1674, and was taken by corsairs to Tunis, where it is said he designed and executed a mosque in the main street leading to the suburb called Babalouk. He was ransomed 22 Feb. 1676, and proceeded to Italy, where he remained five years. On his return to Paris, Mansard took him into the government office of buildings, and made him one of the chief clerks. At this period he translated the sixth book of SCAMOZZI's work on architecture, which appeared with the title *Les Règles des Cinq Ordres d'Architecture*, fol., Paris, 1685; and was incorporated in the *Œuvres d'Architecture de V. Scamozzi*, fol., Leyden, 1713. This was followed by the *Cours d'Architecture qui comprend les ordres de Vignole, avec des commentaires; les figures et descriptions de ses plus beaux bâtimens, et de ceux de Michel-Ange. Plusieurs nouveaux desseins, ornemens et préceptes concernant l'art de bâtir. Avec une explication par ordre alphabétique de tous les termes*, 4to., Paris, 1691, with a life of Vignola prefixed. To this book he owed his immediate as well as his future reputation, for having constantly consulted D'Orbay upon the work, that architect when in want of an assistant to execute his design of the porte de Peyrou at Montpellier, applied to D'Aviler, who left Mansard and proceeded to the scene of the operations, which were finished in 1691-92, so well as to obtain great applause, the patronage of the governor of Languedoc, the creation of the post of architect to the province for himself, the title of architect to the king, and commissions for works at Béziers, Carcassonne, Montpellier, Nîmes, and other places, including the archiepiscopal palace at Toulouse. He

died at Montpellier in 1700. The above particulars are taken from his life, written by Mariette, the publisher of the Paris edition, in 1738, of the *Cours*; which is further remarkable for the confession in the preface, also by Mariette, that the editions published about 1710 and 1720 had been revised by Le Blond, whose designs had been inserted in some cases instead of D'Aviler's, but that his new edition of 1738 had been again altered to suit the taste of the day, and had been illustrated with engravings from the hand of Blondel. The *expiration* or "*list of terms*" is said to have been the very first of all French architectural dictionaries; but FELIBIEN had previously published one in 1676. MILIZIA states that Aviler wrote a dissertation for ANTOINE LE PAUTRE; but this artist's privilege of copyright for twenty years in the *Œuvres d'Architecture* is dated in 1652, about the year in which Aviler was born.

AVITUS (SAINT) Bishop of Clermont in France, from 572 until 594, built the church of S. Gènes at Thiers, in which were inscriptions given by SANMARTHANUS, *Gallia Christiana*, fol., Paris, 1720, ii, 243 (the church is still a Romanesque building). He is mentioned by FELIBIEN, *Recueil Historique*, 4to., Paris, 1696, on the authority of some life of the saint, as having also built the church of Notre Dame du Port at Clermont. This saint is generally confounded with one of his namesakes, who was archbishop of Vienne.

AWA and AWAHAUNG. The Hindoo name for Awa in the Burmese empire.

AWARD. A judgment, made in writing, signed, and sealed by the arbitrator or arbitrators, on any subject, at the request of parties who are at variance, in order that the matter in dispute may be decided without being discussed publicly in a court of law or equity. ARBITRATION. It should be signed by the arbitrators simultaneously, and to have legal efficiency requires a stamp, which may however be subsequently affixed. The arbitrators have power over the costs, as well as over the matter in controversy; and if they be referees from a court of Nisi Prius, can refer the costs of the suit to be taxed by the officer. The form of the award is immaterial; it may dictate and direct; or assume the shape either of an opinion, or of an authoritative valuation (APPRAISEMENT); it is not necessary to follow the terms of the reference *literally*, though the subjects referred, at least in cases under litigation, should be adjudicated specifically, and not settled in a collective mass. The grounds of decision need not be set forth; a dispensation which few arbiters are imprudent enough to neglect; some of the cases, however, indicate that even unsound reasons appearing in the decision will not impeach it, if other good grounds might have been present in the case.

By the statute 9 and 10 William III, c. 15, it is enacted that parties desirous to end a controversy may agree that their submission of the case to arbitration shall be made a rule of any court of record; and after such rule be made, the party disobeying the award is liable to be punished for contempt of court. When a submission to arbitration has been made a rule of court, it is not revocable, by the act 3 and 4 William IV, c. 42, by either party without leave of the court. The award may be set aside for various causes, as corruption, informality, etc., by motion in court within one term after the award is made. As to an opposition to the award, the agreement of both parties to set it aside will not prevent either from subsequently adopting it. If the alleged vice exist on the face of the document, it is sufficient to object to it when the other party brings it into court; but for any grievance in the mode of making the award not so obvious, prompt legal process must be adopted to set it aside. The weight of presumption is always thrown in favour and support of the award, which is deemed to be founded on the whole matter in dispute, and on full evidence. It is taken entire, not separating the involved questions of law and fact, even (according to recent cases) where made by non-professional arbitrators. Any defect urged must be "plain and gross", and no explanation is admitted even from the arbiters of what is

clear on the terms of the decision. But according to the *BUILDER Journal*, vii, 346, where an architect, having inadvertently omitted formally to award as arbitrator on a builder's account a sum for extras about which there was no dispute, afterwards intimated the inadvertence to the debtors and gave affidavit thereof, Lord Denman, before whom the debtors proclaimed the decisive character of the first award, made the rule absolute for setting the award aside. A direction to do an illegal or impossible act, or addressed to a party not amenable, or affecting a matter not submitted, *if it can be clearly separated* from the rest, will be deemed surplusage, and not vitiate the main decree.

Subject to the above remarks, an award, however, must be coextensive with the reference, final, and certain, *i. e.* definite; it must not simply direct the abatement of a nuisance, but indicate what works are to be executed to effect this: nor is it enough to direct one of two or more persons to do some act, but a direction to an individual to adopt one of two courses is conclusive: and an amount or sum is sufficiently determined when mere measurement or computation remains to be taken or made. Defect of statement as to accessory circumstances may be supplied by implication, as that an act to be performed be within reasonable time, etc. Lastly, it is advisable that an award should be drawn up by a lawyer, as there is a variety of technical points which are necessary to be attended to for its validity, besides the form of the adjudication itself; such as the mode of signing it, the stamp, delivery to parties, etc. WATSON, *A Treatise on the Law of Arbitration and Awards*, 3rd edit., 8vo., London, 1846.

T. T.

AWL (It. *lesina*; Sp. *lesna*; Fr. *alène*; Ger. *ahle*). A small tool used by joiners and other mechanics, which consists in a piece of sharpened iron or steel brought to a fine point, fixed in a handle, and used for boring wood. BRAD-AWL.

AWLTER and AWTER are old English words for ALTAR.

AWNDRIRONS. An old English form of ANDIRON.

AWNING. A word which appears to have been chiefly employed by sailors for a sail cloth or tarpaulin thrown over a rope, so as to form a place sheltered from the rays of the sun. This expeditious mode of forming a tent was also used upon land; and the name crept into the technology of building together with the fashion of making projections from the face of a building which should serve the same purpose; these projections have even till lately been made of sail cloth, asphalted felt, tarpaulins, and similar substances; but these have been superseded by boarding, slating, lead, copper, zinc, and by bricks or tiles in cement, which last have even been used in forms imitative of the curve assumed by any flexible material when not tightly stretched, and having its top edge held at a distance from, and higher than, the bottom one. The relation of the awning to the original drapery is still remembered in the traditional scalloping and other forms given to the pendent portion of the ornament that is generally placed immediately below the drip of the projecting shelter. The origin of the word may perhaps be found in the late Latin terms ANTEVANNA and AUVANNA, or in the old French word *avantans*. VELARIUM.

AXARACA. The Spanish architectural term for such ornaments of fretted, twisted, or knotted work as are seen in Arabic decorations. 66.

AXE, or BROAD-AXE (It. *azza*; Sp. *hacha*; Fr. *hache*, *cognée*; Ger. *axt*). A tool used in hewing timber. It consists of a steel edge to an iron head, with a flat blade technically called the "bit" placed at the top of a wooden handle, which follows the direction of the cutting edge: it thus differs from the curved blade fixed across a handle,

which is called an ADZE. It is principally used by carpenters; but masons and bricklayers also use such an instrument, varying in form according to the material upon which it has to act. An axe so small as to be used with one hand, is called by



joiners a HATCHET. The modern method of making an axe is given in the *BUILDER Journal* for 1850, p. 226. PICK-AXE.

The *celts*, also called axeheads, found in various parts of Europe, and abundantly in Britain, are quite as likely to have been intended for hoes or spuds as for hatchets.

AXELLA, AXILA, and AXILIA, are sometimes found written for ASCELLA, just as AXER very anciently, and AXILIA, in late Latin times, were used instead of ASSER. 80.

AXIA. A town in Etruria, now represented by CASTEL d'Asso or Castellaccio, on the south bank of the river Arcione. The necropolis was on the northern bank, and presents sepulchral chambers, having "square architectural façades with cornices and moldings in high relief" hewn out of the soft tufo rock. These excavations are referred to 300 B.C. by ORIOLI, in INGHIRAMI, *Monumenti Etruschi*, 4to., Fiesole, 1821-26, iv, 175. DENNIS, *Cities, etc., of Etruria*, 8vo., London, 1848, i, 229-241, gives sketches of the site, the doorways, and the peculiar moldings of these chambers.

AXIMENEZ. A Spanish architectural term derived from AXIMEZ, and used to express any place sheltered from the sun, especially a cloister. 66.

AXIMEZ. A Spanish term, sometimes written *ajimez*, for a window divided by two or three columns into three or five arch-headed lights, such as are seen in the Spanish-Gothic and Arab architecture. 66.

AXIS. This word, sometimes found written in Latin authors for ASSER and ASSIS, is used by VITRUVIUS, iii, 3, apparently for the thickness of the thinnest portion of the pillow of the volute in the Ionic order, where he states that the axes are not to be thicker than the eye of the volute, though most commentators have translated it as the fillet of the volute. The term is also employed by VITRUVIUS, iv, 2, for a joist: and it has been translated by RICH, *Illustrated Companion*, 8vo., London, 1849, with great plausibility, as the hanging style of a door, in explanation of STATIUS, *Theb.*, i, 349, "axemque emoto cardine vellunt."

The term is now generally employed by writers upon architecture, not only for a line passing through the middle of any geometric figure and cutting all the ordinates at right-angles into two equal parts, but for the primary and secondary central lines of a design: an axis is sometimes considered to be spiral, as in the case of a hollow twisted column. The lines passing vertically and horizontally through the centre of the eye of the Ionic volute are also called axes.

AXUM (the ancient AUXUME). A village with two hundred houses built of stone, but formerly the metropolis, destroyed about the years 925 and 1535, of Tigré in Abyssinia. The cathedral, dedicated to S. Michael (for Axum has still the rank of an episcopal city), was rebuilt about 1657; it is about 111 feet long, and 51 feet broad, by 40 feet high, with a flat roof, and of little ecclesiastical character, although, with the exception of that at Chelicut, it is the finest in Abyssinia. Near this edifice is a square enclosure with a chamfered pier (having a square head and base) at each corner, with a seat and footstool near the centre; these are said to have formed the coronation chamber and throne of the Axumite monarchs. The principal objects of interest to travellers have been some inscribed stones, and the fifty-five obelisks, of which fifty-three are supposed to be no longer erect. Of those which are still standing, one is small and plain, but the other is perhaps the most curious of any such objects: it is quadrilateral, but oblong in plan; constructed of granite and monolithic; about 60 feet high, of bold relief, and in good preservation; it differs considerably, like the smaller one, from other works called by the same name, in not having the usual pyramidion. The large obelisk has a semicylindrical-headed apex, resembling the top of some cippi, united by a necking to the shaft: the wider side or front also has the face sunk from a band or border left all round the margin, and at the bottom of the sinking thus formed is the representation of a doorway; above which,

and on the bands and face of the front, and on the two return sides, there are nine rows of ornaments, which are sometimes called triglyphs, but may rather be taken for windows separated from each other by a band or string-course and a row of pateras. The best authorities give the honour of the erection of this monument to the monarch El Asguaga, who is said to have reigned A.D. 176-252, or to El Aizana, 316-342. There are great discrepancies in the illustrations of this obelisk, given by the following travellers: BRUCE, *Supplement to Travels*, 8vo., Edinburgh, 1805, iv, 321; VISCONTI VALENTIA, *Voyages*, 4to., London, 1809, iii, 87-179; SALT, *Voyage to Abyssinia*, 4to., London, 1814, *passim*; RUEFFEL, *Reisen*, 8vo., Frankfurt, 1838-40, ii, 268, and illustrations in folio. These works must be carefully compared for their corrections of themselves and each other. GIBBON, *Decline*, etc., Bohn's edit., 8vo., London, 1854, iv, 495.

AYMELLUM (Fr. *email*). The late Latin word which is represented by the English term AMEL or AMMEL, and in Italian by the word *smalto*, from the barbarous Latin *smaltum*: the terms aymellatio, aymellatus, and aymolator, are respectively found in mediæval records for enamel work, enamelled, and enameller. 80.

AYODIA. One of the names of OUDE in Hindostan.

AYRALE, AYRETA, and AYRIALE (Fr. *ayraut*). Late Latin terms for a plot of building ground. AREA. 80.

AYSA and AYSIS are sometimes found written for ASSER and ASSIS. 80.

AYSIAMENTUM. A late Latin word, translated by BRITTON and BRAYLEY, *History of the Palace, etc., of Westminster*, 8vo., London, 1836, by the term "conveniency". It is sometimes used instead of *aisantia*, for a service which by charter or prescription a person is bound to render to some neighbour without profit, such as to take off drainage, to give liberty of passing through fields, etc. It is probably the term from which the legal word easement is derived. SERVITUS. 13.

AYTOUN or AYTOUNE (WILLIAM). The chief merit of Heriot's Hospital in Edinburgh, a structure erected in the middle of the seventeenth century, formerly attached to Inigo Jones, is now attributed to Aytoun, whose portrait, inscribed "Measter Meason to Heriot's Vorke", hangs in the governor's room. Under the article ARCHITECT, it will be found that in 1631 he contracted to superintend the erection of this building; (*BUILDER Journal*, vol. xi, p. 764) Innes House, Morayshire, is known to have been designed by Aytoun, who received as his fee "for drawing the form of the house on paper" a sum of £26:13:4. J. ROBERTSON, given in *Transactions of the Architectural Institute of Scotland*, i, 63.

AZAGUAN. A corruption of ZAGUAN. 66.

AZAHRA or MEDINET AZAHRA. A city built by Abderrahman III. Anasir, on the banks of the river Guadalquivir, about five or six miles below Cordova in Spain. Both CONDÉ, *Hist.*, 8vo., London, 1854, i, 418, and GIRAULT DE PRANGÉY, *Essai*, 8vo., Paris, 1841, p. 50, expatiate upon the well authenticated descriptions of the luxurious splendour, fairy elegance, and marvellous grandeur of a palace or alcazar, a mosque, a mint, and barracks, all completed about A.D. 936, but of which not any traces, except the coins with that mint mark, remain to justify the eulogy.

AZANI (the AEZANI of the Latins). This is one of the modes in which travellers write the ancient name of a town in Asia Minor, now represented by a village called *Tchafder hissar* by TEXIER, *Tardere hissar* by KEPPEL, and *Tchavdour hissar* by HAMILTON. In addition to the particulars of the ruins mentioned in the article AIZANI (which is the proper manner of writing the name, according to medals), it is perhaps desirable to add that the Viscount S. Asaph, afterwards Earl of Ashburnham, who visited the ruins in 1824, observed that he had "nowhere seen in Asia Minor so much of ancient architecture standing as at Chavdour"; and "that the theatre (at Aizani) appears to have been connected with another structure, pro-

bably a stadium; but instead of being parallel to the scene of the theatre, as has been found in several instances in Asia Minor (LEAKE, *Journal of a Tour in Asia Minor*, 8vo., London, 1824, 244) the latter is, as it were, formed by prolonging the extremities of the cavea beyond the scene in parallel lines." ARUNDELL, *Discoveries*, 8vo., London, 1834, p. 349. The last named author observes, with great justice, that an excellent description of the ruins is given by KEPPEL, *Narrative of a Journey across the Balkan*, etc., 8vo., London, 1831, ii, 204; but his notice mentions that the bridges over the river Rhyndacus have had BALUSTRADES, and are formed of elliptic arches, while TEXIER, *Description de l'Asie Mineure*, fol., Paris, 1838, expressly calls them "à plein cintre" with plain parapets. TEXIER also notices that there are no plinths to the columns in the posticum of the great temple, which has an extra row of columns behind those carrying the pediment of the front, as is the case at Aphrodisias and Magnesia. The same writer shows the use of an ANGLE MODILLON in the cornice of the scene of the theatre, and a curious horned volute (*i. e.* without a solid eye) to its Ionic columns.

AZNAR (FRAY ATANASIO DE), was elected an *academico de merito* of the Academy of S. Fernando at Madrid, 2 February 1758. His best work seems to have been the parochial church of Munebrega, in the province of Calatayud in Spain, finished after his death, which took place in 1764. 66.

AZON is here mentioned only to correct a mistake which has crept into MILIZIA, through a passage in FELIBIEN, *Vies*, 4to., Paris, 1696, who states that Azon was a monk engaged in building the cathedral at Séz in France, in the year 1049-1050, having wrongly read his authority, BRV, *Histoire des pays du Perche*, etc., 4to., Paris, 1620, who in ii, 13, ending with the year 1064, only states that the church of S. Gervais burnt a little before that year, "avoit esté bastie auparavant par le religieux Azon de la destruction et ruine des murs de la mesme ville", which might have occurred some centuries previously.

AZOTEA, AZOTHEA, and sometimes improperly written AZUTEA. The Spanish architectural term for the terrace or platform on the roof of a house. 66.

AZPIALAGA (MARTIN DE) was engaged in 1620, with Bartolome Abril and others, on the Pantheon of the Escorial, from the designs of Juan Gomez de Mora. 66.

AZULEJO. A Spanish word derived from *zulaj* or *zuleich*, the Arabic terms for a glazed tile, which were themselves adopted from *azul* or *lazurad*, the first of such tiles seeming to have been of a blue colour. GOURY and JONES, *Plans, etc., of the*

Alhambra, fol., London, 1842, pl. 4, observes that the pattern appears to have been impressed on the clay by molds, and the colours to have been run while liquid, between the lines: these authors do not admit the probability of such tiles having been used as floor decorations. GIRAULT DE PRANGEY, *Essai sur l'Architecture des Arabes*, 8vo., Paris, 1841, p. 127, quotes EBN SAID to the effect that such ornamental tiles were exported to the East from numerous factories in Spain, the Arabic word *azulaj*, translated *mosaïque en faïence*, being applied in contradistinction to the Byzantine works in small glass cubes; and thence it is presumed that that country has the honour of their invention. The oldest known examples are in the Villa Viciosa chapel, in the former mosque at Cordova; and some of the finest dated specimens are at Seville.

Alizar, also a Spanish word derived from the Arabic, has several interpretations; like ALICATADO, it means a panel or ornament of azulejos (but probably rather of alizares) in walls, etc.; when used as a verb, it implies to take dimensions. The term ALIZARES or *alizeres* may be used as synonymous with azulejos, while the word *alizata* means the act of measuring. It is possible that the difficulty might be solved by considering the alizares as having originally been plaster casts used for wall decorations. ALBOHAIRE. ALMORREFA. 66.

AZURE. A bright and florid tint of blue, equal in force to ultramarine with the addition of a little white. The term is properly only applicable to a paint like that formerly called Lambert's blue, which was a preparation either of Armenian stone, or of this material mixed with smalt, when it was known as Dutch ultramarine. The Armenian stone is a blue ore of copper, like lapis lazuli; but the most obvious difference is that the hardness of lapis lazuli is wanting in its rival, as well as the golden coloured spots, which are generally replaced by green or black specks. 13.

AZURE-STONE is a name frequently given, in accordance with PHILLIPS, to lapis lazuli, in contradistinction to azurite or lazulite. 14.

AZZOLINI (JAGO), an Italian by birth, was engaged by Bibiena to assist him in the scene room of the royal theatre at Lisbon; and after the great earthquake of 1755, he superintended as architect the completion of the seminario. He directed the scenery of the theatre d'Ajuda at Lisbon, from 1767-68 till his death, at the age of about seventy years, in 1786-87. He made designs for a royal riding school (*manège*), and for the executed towers of the church of S. Francisco de Paula at Lisbon. José Carlos Binbeti and Manoel Piolti were among his numerous pupils. 88.



ABATTOIR.

PLATES 74, 75, AND 76.

ABATTOIR, the French name for all slaughter-houses, is now adopted into the English language, but is more generally applied to public slaughter-houses only, and it is in this restricted sense that the word will be employed in the following observations.

It appears that some concentration of the slaughter-houses, analogous to that which prevails at the present day in many large towns of the continent, existed in ancient Rome under the later republic, and the first emperors.

From the frequent allusions of the satirists to the number of modes in which swine's flesh was prepared, it would seem also that the ancient Romans consumed more pigs than they did cattle. It is probable that the difficulty of rearing cattle in the burning plains of Italy, especially before irrigation was applied to the extent to which it actually exists in Lombardy and Piedmont, may account for the preference of agriculturists to rear the harder animal, the pig.

From passages in Plautus, Terentius, Plinius, Florus, and Tacitus, it may be inferred that the cattle consumed in Rome were first exposed in a Forum *Boarium*, or *Suarium*, according to their nature; they were then led to the *laniena*, where they were killed and prepared by *lanii*, *laniones*, or *carnifices*; and finally the meat thus prepared was exposed to sale in the *macella*, or the market places for provisions. The Boarii and Suarii (the cattle and pig butchers), originally formed separate *collegia*, or corporations, under the supervision of the *praefecti urbis*. They elected syndics, who decided any disputes between members of the respective corporations, and who were empowered to prescribe the regulations of the trade. Subsequently the two corporations were united.

The Forum Boarium was situated near the Circus Maximus, between the Montes Palatinus and Aventinus, and at the extremity of the Velabrum. It was in the immediate vicinity of the Porta Carmentalis, and near the outfall of the Cloaca Maxima. According to Tacitus, the name "Boarium" was given because a bronze figure of a bull was placed in it; and Plinius states that this figure was brought from Ægina. Festus, however, expressly says that the name was given "quod ibi venderentur boves". The modern church of S. Giorgio in Velabro is placed near the ancient Forum Boarium: see Plautus, in *Curculione*; Terentius, *Eumuchus*; Tacitus, *Annales*; Plinius, etc.; or more concisely, GRÆVIUS, *Thes. Ant. et Hist. Italia*, etc., fol., Leyden, 1725; and MURATORI.

No details of the interior organisation of the *lania* have been handed down to us; but from the fact of the various trades connected with the sale of the cattle, and with the preparation and sale of the meat, being concentrated near the mouth of the Cloaca Maxima, we may perhaps assume that some attention was paid to their drainage. The locality in question was also removed from the centre of the town, and placed so as to allow the cattle to be conducted to the markets, without traversing the streets; the information upon the subject of this branch of the municipal regulations of the capital of the ancient world is, however, very limited.

In the museum of the Vatican there exists, or existed in the time of d'Alembert, a slab containing a decree by Turcius Apronianus, praefect of the town, regulating the sale of meat;

ARCH. PUB. SOC.

from which it would appear that in the early periods of Roman history, the bargains between the buyer and seller were made in a manner similar to the game of *morra*, practised in Italy amongst the lower classes at the present day. The decree in question prescribed that the sale should thenceforward be effected according to weight. The decree is quoted at length by D'ALEMBERT and DIDEROT, *Encyclopédie*, in the section of "Antiquité", under the head "Boucherie". The same authority also describes a medal of Nero, to commemorate the erection of the Macellum Magnum, built by his orders for the sale of meat. It is represented on the reverse of the medal, as a circular building surrounded by columns, and raised on four steps. It is said that this Macellum was a very magnificent building, even when compared with the baths of imperial Rome; but the writer of the *Encyclopédie* does not quote his authorities for this assertion.

During the middle ages several attempts were made to remove slaughter-houses from the inhabited parts of the towns, and in the time of Charles IX of France, a building was erected at the Marché Neuf of Paris, upon the banks of the Seine, for the express purpose. It was built under the directions and upon the designs of Philibert de l'Orme, and appears to have been nothing more than a large hall where the beasts were slaughtered in common. In many other towns, in our own country as well as abroad, similar public abattoirs were constructed; and it is therefore more than probable that several of them may have a date antecedent to that of the celebrated abattoirs of modern Paris. But as these were the first to be established upon general principles, and for the use of a large metropolis, they may be considered to offer the greatest historical interest; whilst at the same time the remarkably successful manner in which the various problems connected with their construction and organisation have been solved, renders their examination in detail far more interesting.

Until the year 1810, Paris presented similar spectacles of suffering on the part of the animals, and brutality on the part of the drivers, to those which revolt the inhabitants of London; and like our own slaughter-houses, those of Paris might have been included in d'Alembert's definition, for he states, "les boucheries dans la plupart des villes modernes sont des rues infectes, où les gens occupés du même métier ont leurs étaux"; in fact, he adds, "telles sont celles de Paris, excepté celle du Marché Neuf". The butchers used to slaughter the cattle at their places of business; and the various trades connected with the disposal of the offal, such as the tripe boilers, fat melters, etc., were equally carried on in the heart of the town. The circulation in the streets was necessarily impeded there, as it is here at the present day, by the passage of the animals, wearied, faint, and exhausted, sometimes maddened by pain and thirst from their exposure in the markets, and their journey in the paved streets. About that period, however, Napoleon appointed a commission to examine the whole question of the supply of butchers' meat to Paris; and on the 9th February 1810, a special committee was named for the purpose of preparing the designs for the five abattoirs it had been determined to erect.

This executive commission was composed of the five architects to whom the works were entrusted, namely, MM. Petit-Radel,

Leloir, Gisors, Happe, and Poidevin; and at its head was the vice-president of the "Council of Civil Buildings"; M. Combaud, a retired master butcher, was appointed secretary.

The first plans proposed for the abattoirs of Paris were designed, according to BRUYÈRE, more with a view to their being worked by a company, than according to the system actually adopted, in which the butchers are at liberty to kill their beasts at their own convenience, and perfectly independent of one another. The works of the abattoirs at Montmartre were even commenced upon these original plans; but when BRUYÈRE was appointed vice-president of the Council of Civil Buildings, he deemed it necessary to introduce several modifications, which have led to the construction of the abattoirs as we see them at the present day.

The cattle for the supply of Paris are purchased at the various markets situated outside the town, at Poissy, Sceaux, la Chapelle, St. Denis, Gentilly, Montmorency, Arpagon, and St. Germain. The markets of Poissy and Sceaux are exclusively for the sale of bullocks, cows, calves, and sheep; that of la Chapelle, for cows and pigs; the others are for the sale of pigs only. Poissy is situated about seventeen miles to the north-west of Paris; and Sceaux, about seven miles and a half to the south; or, in French dimensions, respectively twenty-seven and eleven kilometres.

From the two principal market places the cattle are driven, according to the requirements of the purchasers, to a series of lairs, six in number, one for each of the five Paris abattoirs, and one for the suburban districts. They are thence driven to Paris, under the care of drovers named by, and under the direct control of, the prefect of police, to whose instructions as to the manner of driving, and the route to be followed, the drovers are bound to conform. The cattle are collected into droves of not more than forty each; the bulls are fastened to the tail of a cart; the calves are laid one upon the top of the other, with their legs tied, either upon carts, or moveable trucks adapted to railway waggons; and the sheep are driven in flocks of not more than one hundred and fifty each. The price for thus conducting the beasts to the abattoirs is also fixed by the prefect of police, and the drovers are responsible for any accident which may happen to them whilst under their care.

The cattle purchased at Poissy are obliged to enter the limits of the octroi (or the region within which the municipality is entitled to levy tolls) by the barrière du Roule; those purchased at Sceaux enter by the barrière d'Enfer. From thence they are driven to the respective abattoirs along the outer boulevards which surround Paris, immediately within the line of the octroi walls. Beasts purchased in any of the other markets are subjected to similar arrangements, and are only allowed to be driven upon the outer boulevards. Under no circumstances whatever are they allowed to traverse the more densely populated parts of the town, or to interfere with the traffic of the streets. In provincial towns also the same rules are enforced; the beasts are led round, never through, them, at least if they be of any importance.

The five abattoirs of Paris are placed in the vicinity of the exterior boulevards, and more with reference to the geographical position of the town than to the wants, or the density of the population near to them. They are, beginning from the west, and passing thence through the north, and east, to the south:—

1. (Plate 1, Fig. 2.) The abattoir of Roule, situated in the rue Miroménail, near the barrière de Monceaux.
2. (Fig. 4.) The abattoir of Montmartre, near the barrière of the same name.
3. (Fig. 7.) The abattoir of Ménil Montant, near the Marais. These three are on the north side of the Seine.
4. (Fig. 3.) The abattoir of Villejuif, near the boulevard d'Italie.
5. (Fig. 1.) The abattoir of Grenelle, near the Invalides.

These two are on the south side of the Seine.

It will be seen from the plans, Plate 1, that the principles of the distribution are the same in all these constructions, and that they consist of a series of detached buildings for the required purposes, separated by wide open courts. They are composed, 1. Of residences for the gatekeepers and guardians, marked A A, Fig. 1, with the necessary offices and machinery to register and weigh the cattle. 2. Of large spaces K K, enclosed by iron railings, into which the beasts are driven from the markets, and from which, after being selected, they are led to the stalls appropriated to the respective butchers. This sort of classification of the cattle affords also the means of a preliminary examination as to their sanitary condition by the government inspector named for that purpose. 3. Of the lairs, or "bouvieries" B B, which surround the killing places, and are always of equal area to the latter. 4. Of the killing places themselves, or "échaudoirs" C C, arranged in a double row on either side of a court D D. 5. Of the tallow-melting rooms, or "fondoires" F; and the tripe cauldrons, or "triperies" E E. 6. Of the various dependances, such as the engine for raising water G; the coach-houses and stables for the butchers H H; privies and cesspools I I; the positions of these dependances vary, in many cases, according to the natural configuration of the ground. The above references apply to the abattoir of Grenelle, Plate 1, Fig. 1; but the arrangement of the various departments is sufficiently uniform throughout all the Paris abattoirs to dispense with a description of each. They are given in block, from which the disposition, etc., of the buildings will be readily understood.

The lairs are of two stories; the under one being reserved for the cattle, and the upper story being used as a magazine for fodder, or other provisions. The clear internal dimensions are usually forty-five mètres in length, by nine mètres in width (one hundred and forty-seven feet eight inches by twenty-nine feet seven inches, with a height of fourteen feet ten inches to the underside of the ceiling). The cattle are attached to rings let into the wall, and are allowed a frontage of one mètre each, or about three feet four inches; the sheep are enclosed in wooden pens, tolerably high, and provided with mangers. A regular inclination is given to the floor, from both sides, towards a channel which conducts the liquid manure to the cesspools. In some of the abattoirs water troughs are placed for both the sheep and the cattle; but generally speaking they are led to large open watering places, or "abreuvoirs", in the courtyards. Access to the fodder magazines is obtained by means of staircases, generally placed on the same side as the sheep pens.

Between the lairs and the slaughter-houses are open passages, ten mètres, or thirty-two feet ten inches, wide. The slaughter-houses, arranged in a double row, are also separated from the opposite group by similar open passages, thirty-two feet ten inches wide, and their clear dimensions are the same as those previously stated for the lairs; that is to say,—a block of eight slaughter-houses, and the staircase to the lofts, measures one hundred and forty-seven feet eight inches by twenty-nine feet seven inches, in the clear of the walls enclosing the two last slaughter-houses. The internal dimensions of the separate slaughtering places are twenty-nine feet seven inches by fifteen feet eight inches, and the well hole to the loft with the passage leading to it is of the same dimension.

In the Paris abattoirs this arrangement, by which a staircase is reserved to give access to a loft occupying the whole range of the building over the slaughter-houses, prevails without exception. The second story was designed for the purpose of receiving the fat from the carcasses slaughtered below, but it has been found that there was so great an advantage in extracting the stearine from the fat at the earliest possible period after the death of the animal, that this loft is very seldom used for any other purpose than as a magazine for the hides. In the provincial abattoirs lately constructed, the second story over the slaughter-houses has been omitted, thereby giving rise to a notable economy in the cost of the construction. Another

recent modification in the details of this description of building, is that the passages between the groups of slaughter-houses, in which many of the operations for preparing the carcasses are carried on, are covered over, instead of being left open as they are at Paris. The abattoirs of Caen, Nantes, and Versailles, may be cited as illustrating the system now generally adopted in France with respect to these details.

The separate slaughter-houses are divided from one another by walls of very hard stone, the "liais" of French architects, about eight inches thick. (The term "liais" must not be confounded with the word used to designate the secondary formation known to our geologists as the *lias*. Both lithologically and geologically, the two formations are essentially different. It is important, therefore, in reading any technical descriptions of the buildings of Paris, to remember that the term "liais", as applied to them, means a compact carbonate of lime, nearly pure, being the hardest bed of the subdivision known as the "calcaire grossier", and of the tertiary formations; whilst in the Départemens the same term is applied to the argillo-calcareous secondary deposit, properly called the *lias*.) All angles, in which blood, or filth, is likely to collect, are carefully rounded off. The bottom is paved, and laid with a fall towards a species of cesspool destined to receive the blood. Great care is requisite in bedding the paving, not only of the slaughter-houses, but also of the intermediate courts, to secure them against the attacks of rats. At Caen it was found that the only means by which these vermin could be prevented from undermining the paving was by bedding the latter upon a layer of concrete three feet thick.

Two longitudinal beams are let into the wall at one end, and suspended from a cross beam at the other, as shewn in the details in Plate 2, for the purpose of receiving a series of rollers, from which the carcasses are suspended during some of the operations; the height to the under side of these beams is about eight feet four inches. A series of wrought-iron hooks are also let into the side walls, as shewn, to receive the carcasses of sheep, or other small animals. In one corner, a single purchase crab is placed, by means of which, and the pulleys attached to the roof, the carcasses are hoisted upon the above-mentioned beams. In one of the opposite and higher corners a stand-pipe, about an inch and a quarter diameter, with a common stop-cock, always under pressure, affords the means of effectually cleaning the pavement whenever it may be required.

Wire gratings are let into the partition walls, and over the doors, so as to maintain a constant circulation of air throughout the building; and it is to be observed that in the abattoirs lately erected a very serious defect exists, inasmuch as from the suppression of the additional story, without having introduced a ceiling beneath the roof, atmospheric influences are able to modify the temperature of the slaughter-houses with great rapidity. It is impossible to call the attention of architects charged with constructions of this nature too repeatedly, or too forcibly, to the necessity for securing a constant and uniform temperature, or the most efficient means of ventilation, both in the interest of the workmen employed, and that of the preservation of the meat. In the Paris abattoirs, these objects are certainly attained in the most effectual manner; and their comparative sweetness, freedom from smell and flies in summer, and constantly uniform temperature, are worthy of particular observation.

Rings are let into the floor for the purpose of tying down the cattle to be killed. All other tools or implements are furnished by the butchers using the slaughter-houses.

Beyond the lairs and slaughtering-places are placed in the Paris, and in the generality of the French abattoirs, the establishments for melting the fat, and preparing the tripes. The former operation is beyond doubt a nuisance, and under many circumstances the latter is not less objectionable. When the two are combined, they give rise to a sickly, fetid smell, which at the same time that it is very repulsive, cannot fail to be pre-

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judicial to the public health. These operations, in fact, should never be allowed to be carried on in the interior of a large town.

In the abattoir of Ménil Montant, the most convenient and the most complete of all those erected in Paris, the tallow melting places, or "fondoirs", are placed in two buildings opposite to the entrance gates, at the end of the large courtyard. In each of these buildings are four fondoirs, separated by wide passages, and with cellars in which the melted tallow may be stored. The outside dimensions of the walls enclosing each "fondoir" are eleven and a half mètres, by eight mètres (thirty-eight feet three, by twenty-six feet three inches); and in each of them is placed a copper of a capacity to hold from one and a half to two tons. The melting is generally performed by means of an open fire; and although of late years it has been attempted to introduce the use of steam for this purpose, little progress has been made in its application. The usual practice appears to be to allow one fondoir to eight slaughtering places.

The "triperics" at Ménil Montant occupy two ranges of buildings opposite to, and of precisely the same dimension as, the lairs, placed transversally to the slaughter-houses; but it would appear that one "triperie", about twenty-nine feet seven inches long, by about thirteen feet two inches wide in the clear, is all that is required for four slaughtering places. A copper is placed in each triperie, and a copious supply of water is laid on.

Stables and cart-houses are provided for the use of the butchers using the abattoirs, in the proportion of one stable and cart-house to every six slaughter-houses.

When the abattoirs were originally constructed, the water supply of Paris was far from being in so advanced a condition as it is at present, and in most of those establishments considerable expense was incurred in sinking wells, erecting engines and pumps, and forming reservoirs. Actually, the water is supplied by the town distribution, from the canal de l'Ourcq, to such of the abattoirs as are near the directions of its mains. It is calculated that about forty-five gallons of water are required for each head of cattle slaughtered. The town of Paris have contracted for an annual supply of about twenty-two million gallons to the five abattoirs; but it is considered that this quantity is not half of that really required.

Upon a review of the system thus sketched, it appears that the necessary conditions for its efficient working have been, upon the whole, successfully resolved in the Paris abattoirs. The cattle are lodged in airy, convenient quarters, where they are allowed to repose from the fatigues of the road before being killed, and in which the government inspectors can easily examine them. In the slaughter-houses the killing and conversion of the carcasses takes place with all the advantages of good air, room, cleanliness, and uniform temperature necessary to insure the healthy state of the meat. The concentration of the fondoirs and the triperies in the same establishments is objectionable; and it would be advisable in any new work of this description, to adopt the modifications of the slaughter-houses and intermediate courts above described.

From the returns quoted by BIZET, it appears that the abattoirs are resorted to in variable proportions, as follows, the terms of comparison being based upon the total consumption for the whole town of each description of animal.

Name.	Cattle.	Cows.	Calves.	Sheep.
Montmartre	42 per cent.	34 per cent.	43 per cent.	50 per cent.
Ménil Montant	29 "	44 "	23 "	27 "
Grenelle	16 "	13 "	17 "	12 "
Roule	9 "	4 "	12 "	8 "
Villejuif	4 "	5 "	5 "	3 "

The number of separate slaughter-houses being respectively at Montmartre and Ménil Montant sixty-four each, at Grenelle forty-eight, at Roule and Villejuif thirty-two each; so that it would appear that the three last-named abattoirs are considerably in excess of the requirements of their immediate vicinity.

This opinion is further confirmed by the fact that in 1846, of the total number of cattle killed in Paris, which was 674,048 animals of all sorts, such as bullocks, cows, sheep, and calves, 320,024 were taken to the abattoir of Montmartre; 192,856 to that of Ménil Montant; 77,678 to that of Grenelle; 54,138 to that of Roule; and 28,852 to that of Villejuif. But it is necessary to observe, that the determination of the proportionate number of slaughter-houses to any particular population, is affected by the two-fold condition of the population in the first instance, and of their average meat consumption in the second. Thus, it is well known that the poorer classes eat comparatively little meat, and that of the coarser description; whilst the greatest average meat consumption takes place amongst the wealthier middle classes. These habits appear to have had fully as much influence as the mere population itself has produced upon the results observed, viz., that the greater number of cattle are sent to the abattoirs at Montmartre rather than to those of Villejuif and Roule, and that the comparatively greater number of calves and sheep are killed at Grenelle.

Each slaughter-house at Montmartre sufficed for killing and preparing about 5,000 animals per annum; at Ménil Montant for 3,130; at Grenelle for 1,618; at Roule for 1,691; and at Villejuif for 900 only. On occasions of great demand it has been observed that it was possible to prepare in one slaughter-house, without inconvenience to the work-people, as many as ten cattle and fifty-five smaller beasts; so that even the abattoir of Montmartre would suffice for a consumption three times as great as is now supplied by it.

The architectural character of the abattoirs of Paris may be judged of by the illustrations, copied from BRUYÈRE, on Plate III. They are bold, massive, and if fitness be the criterion of beauty, they may be considered as possessing that quality. The effect is produced entirely by the broad outlines of the buildings, and no useless detail, no affectation of prettiness, is allowed to interfere with the severity of the composition. Great attention was paid to the choice of materials, and these have been so combined that their respective colours add to the general effect; thus, the piers, strings, and arches are executed of the "roche", a fine-grained, whitish limestone; the spandrils, and many of the large plain spaces of the walls, are filled in with the bistre coloured *meulière*, a species of quartzose concretion, stained by the peroxide of iron, the innumerable cavities of which again increase its picturesque effect,—and the rich brown tint of the tiles, combining with the other colours, gives a generally warm and pleasing tone to the whole mass. The deep shadows of the projecting roofs, and the play of light and shade upon the channels of the pantiles, also contribute to this general effect in a remarkable degree. There is, in fact, about these buildings the singular character of monumental grandeur, if the expression may be allowed, which distinguishes all the works executed by the orders of Napoleon; at the same time that they may be styled perfectly consistent with the objects for which they were erected. In some of the provincial abattoirs recently constructed this simplicity of character has been departed from a little, as in the introduction of the pilasters upon the side buildings at the abattoir of Versailles (Fig. 5, Plate 11), and the bullocks' heads upon the keystones of the arches; but it is certainly questionable whether these ornaments are not misplaced, and inconsistent with the purposes of the building. Slaughtering cattle is a necessary operation; but it may perhaps be considered a proof of bad taste to ornament the place in which it is carried on, because it would induce the belief that a cultivated mind could find pleasure in dwelling upon its details.

The cost of the abattoirs of Paris was considerably in excess of that of the more recently-constructed buildings of the same character; nor should this be matter of surprise. They were the first public abattoirs erected upon a large scale; and necessarily, in endeavouring to solve the difficulties of the case many experiments were made, and many modifications introduced.

The political and financial crisis which France passed through in 1814 and 1815, also increased the difficulties and the cost of these works, as well as delayed their completion. Nevertheless, the total expense was such that the town is able to derive from them an interest of more than five per cent. upon the capital, after paying all the working expenses,—“a description of merit”, as M. Horace Say observes, “by no means to be despised”.

BIZET enumerates carefully the costs of the different abattoirs, and gives a minute account of the length of water-pipes, the number of stop-cocks and of the lamps. The latter details afford but little information to an English architect, because both the water supply, and the mode of lighting, are different in our country from what they are abroad. The most valuable results to be obtained from BIZET's work have therefore been grouped in the following table, in which the dimensions and prices given by him are translated into English. The first column contains the surface of the land occupied by the whole of the respective establishments, with their court-yards, passages, and appendages; the second contains the surface of the roofing; the third contains the cost of the land; and the fourth, that of the buildings.

Name.	Yards suppl.	Yards suppl.	£. Sterling.	£.
Montmartre	44,539	13,000½	1,581½	189,001
Ménil Montant	59,794	14,598	5,308	163,019
Villejuif	32,531	7,475	2,176½	96,350
Grenelle	38,475	9,974	4,862	123,005
Roule	28,297	7,475	8,563½	100,036
Totals	203,636	52,522½	22,491½	671,411

From this statement it would appear that the cost of the Paris abattoirs was at the rate of £3 : 8 : 2 per yard superficial of the whole surface of the ground occupied; and at the rate of about £13 : 4 : 5½ per yard superficial of the covered portions. In consequence, however, of the experience gained by the construction of these buildings at Paris, the cost of similar buildings in the provinces of France has been kept much below the above averages. Thus, at Nantes, the price per yard superficial of the covered portion did not exceed £6 : 8 : 9. At Havre, the price per yard superficial of the whole of the ground occupied was about £1 : 6 : 9; and at Caen, it was about £2 : 0 : 10 per yard superficial.

The abattoirs of Caen, Nantes (Fig. 5, Plate 1), and Versailles, to which allusion has been made, were constructed for, and at the expense of, the municipalities of the respective towns. At Havre (Fig. 6, Plate 1) the abattoirs were built upon lease; the town finding the land and paying the land-tax, the lessee paying all other taxes, building and maintaining the abattoirs to the satisfaction of the town council, upon a lease of eighteen and a half years' duration. The lessee is also, it may be observed, contented with his bargain in this case, hard as the conditions may at first appear.

The working expenses of the Paris abattoirs are about twelve per cent. upon the gross receipts; including all salaries, water-rents, lighting, repairs, etc.

A species of monopoly exists in favour of the public slaughter-houses, in consequence of the legislation upon the subject, which provides that when a municipal abattoir is opened after proper inquiries, with the consent of the Minister of the Interior, no private slaughter-house is allowed to exist within the limits of the said municipality. But as the limits of the municipal districts of the provincial cities are not extensive, at least in such towns as Caen and Havre, the legal monopoly would not ensure sufficient returns upon the outlay, did not the butchers, even of the vicinity, who are equally free from the tolls payable to the corporations, find that they have a direct interest in using these public establishments. It would indeed seem self-evident, and the experience of the French butchers has proved it to be really the case, that the meat, killed and prepared under circum-

stances such as to allow of the observance of all hygienic precautions, must be of a better quality and more likely to be preserved, than that killed and prepared in unwholesome, dark, close, and filthy holes, such as the private slaughter-houses almost invariably are.

It may be as well to state, that there is no law by which towns are compelled to erect abattoirs; the general feeling, and we may add, the common sense of the respective municipal councils, has been found sufficient to ensure their construction in nearly all the large towns of France.

The revenue is based, at Paris, upon a toll of two centimes per kilogramme of the meat taken from the establishment, or about 0.0907 of a penny per pound avoirdupois. The rate per head may then be taken at about 5s. 9d. per bullock; 5s. 2d. per cow; 1s. 0½d. per calf; and 4d. per sheep. The rent for the "fondoires" is 10d. per 100 kilograms, or 2 cwt., of tallow produced, the melters finding their own fuel. The payment for the tripe-boiling places is 3d. for every bullock's tripe, and 0½d. per tripe of a sheep. In all cases the town furnish everything which may be considered to constitute what we should technically designate as *plant*; the tools and other working utensils, are furnished by the parties using the abattoirs.

Before examining the different systems adopted in other towns, it may be advisable to mention, that although the town of Paris has not yet completed any abattoirs for the slaughtering of pigs, the preparation of the carcasses of those animals is only allowed to take place in private establishments under the immediate superintendence of the municipal authorities. The private slaughter-houses for pigs are situated Rue de Carême Prenant, Rue St. Jean Baptiste (out of the Rue Pepinière), and Rue des Vieilles Tuileries. There is a large pig abattoir at Nanterre, not far from St. Germain, in which latter town one of the most important pig fairs is held, on the Mondays; and in it nearly half the pigs consumed for the supply of Paris are prepared. The abattoir of Versailles, Fig. 2, presents considerable accommodation for this purpose; and indeed, the bulk of the pork brought into the capital appears to be conveyed thither as dead meat. The town of Paris commenced some years since a pig abattoir in la Rue du Chateau Landon.

The payment for the use of these private slaughter-houses is based upon the same principles as for the use of the public abattoirs, or at the rate of 0.0907 of a penny per pound avoirdupois, if the beasts be prepared by the butchers, or rather the meat salesmen themselves. The proprietors, however, usually undertake to slaughter, prepare, and deliver the pigs at the rate of 1s. 3d. per head, to any part of the town.

The dimensions of the "échaudoirs" in the pig abattoirs are different from those destined to larger animals. At Nanterre they are sixteen in number, arranged according to the wood-cut below, alternately an échaudoir and a "bruloir"; for the practice in France, and generally upon the Continent, is to burn off the bristles, instead of removing them by scalding as is done in our own country. The separate divisions are made about eighteen feet wide, from centre to centre of the side walls, and about twenty-two feet two inches long, with a clear height of about twelve feet, which is carried to about twenty-four feet over the burning-places, or bruloirs, to allow the escape of the smoke. The slaughtering places are made with a rapid inclination towards a gutter and basin, placed for the purpose of collecting the blood.

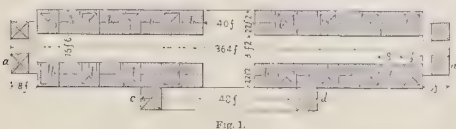


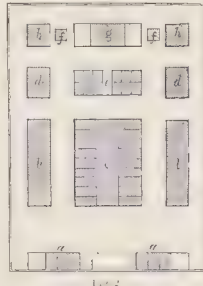
Fig. 1.

aa are the offices and keepers' residences; *bbb* are the slaughtering and burning-places; *c* is a shed, where the carcasses are washed after burning; and *d* is a tripe-ry. The total sur-

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face of land occupied by this abattoir is 3,305 yards superficial, including the pigsties, etc.; its cost was £3,880; and the average number of pigs killed in it is about 40,000 per annum. The percentage of the working expenses is rather greater than in the Paris cattle abattoirs, on account of the distance from the seat of consumption.

The abattoir of Versailles comprises a series of slaughtering-places for pigs, simultaneously with those for cattle, as is indicated upon the accompanying wood-cut. The offices and residences are marked *aa*; the lairs *b*; the cattle abattoirs *c* (see also Figs. 5, 6, and 7, Plate 2); the pigsties *d*; the pig abattoirs *e*; the burning-places *f*; the fondoires *g*; the reservoirs are over them; and *h* the cesspools and privies.



OTHER SYSTEMS OF ABATTOIRS.

In some of the towns upon the Continent the details of the abattoirs are arranged upon systems essentially different from that adopted in Paris.

In the town of Rochefort, upon the Charente, the municipality erected a large slaughter-house, in which the whole of the butchers of the town kill and prepare their beasts in common, and under the same roof. Crabs are attached to the walls, by means of which the animals are raised during the operations of their conversion, and a supply of water is laid on. But the working of this establishment is extremely inconvenient; because, as there are no places in which the tools and utensils can be placed in the intervals of their being used, it is necessary to transport them to and fro, on every occasion of their being used, and also to remove the meat as soon as it is prepared. The butchers of Rochefort have usually lairs attached to their own premises, or in the faubourgs of the town; moreover, as the immediate neighbourhood is almost exclusively a grazing country, the cattle are not often kept in the town itself.

This building suffices for the wants of a town whose population is between ten and twelve thousand souls.

At La Rochelle, the abattoir consists, as at Rochefort, of a central hall, where the beasts are slaughtered in common; but in addition to it, there are a series of lock-up divisions for the separate butchers. It has no other accessory building, either for receiving the cattle, for the tallow melting, or for preparing tripe.

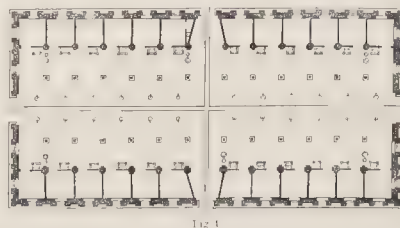


Fig. 3.

This building was erected upon a lease of twenty-five years, and at an expense of about £4,000: the lessee receiving the dues upon the slaughter of the beasts, and undertaking to give up the abattoir, in a substantial state of repair, at the expiration of his lease.

The abattoir of Grenoble differs from the above, in that the

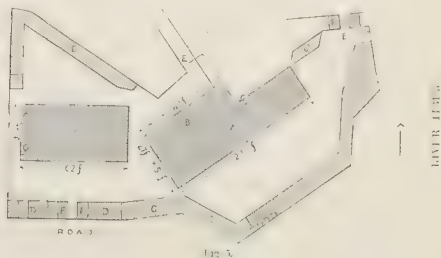
smaller animals, such as the calves and sheep, are slaughtered and prepared in separate divisions. The accessory buildings are rather more complete than at Rochefort, or la Rochelle, inasmuch as they contain courts, stables, and a storehouse for the raw and melted tallow.

At Strasbourg and Marseille are also abattoirs; but although they differ somewhat from those already described, their mode of construction is not such as to call for particular notice. At Lyons, the abattoirs are combined with the meat market, but in a very disagreeable manner. The cattle are slaughtered in the market-place itself under the eyes of the purchasers, who may even be forced to wade in the blood of the victims. Unquestionably, this may be classed amongst what Sir Wm. Chambers would describe as the models to be avoided.

The abattoir of Mantua, situated upon the banks of the canal, is perhaps more worthy of notice for what it might have been made, rather than for what it really is. BRUYÈRE describes it as consisting of a basement, nearly upon the level of the canal, in which are performed the operations requiring the use of large quantities of water, or which produce much refuse; the former is supplied, and the latter removed, by a stream of fresh water constantly running. Above this basement is a ground-floor, upon which the animals are slaughtered, and the meat market is held. Evidently, it would have been much more satisfactory, if in this case, as in that of Lyons, the whole of the operations connected with the killing and conversion of the animals, were removed from the sight of the public. A reference to Plate 3 will, however, show that the general external effect of the building is satisfactory.

At Vicenza, the operations of slaughtering and preparing butchers' meat are carried on in a portion of the great basilica of Palladio, on the opposite side to the Piazza del Biade.

In modern Rome, the abattoirs are situated upon the road near the city walls, and in the immediate vicinity of the Tiber. The beasts enter by a gate opposite to the Campo Borazio, and are, when required, conducted to a series of lairs constructed against the enclosure walls; a difference in the details of these lairs appears to exist when they are intended to receive the animals destined to remain for several days. Two large slaughter-houses A A B, are provided for the cattle, which are killed in common; covered sheds D D, and uncovered pens or enclosures c c, are formed against the enclosure walls; lodgings and offices



are erected for the employés F F; cisterns and wells are also provided, but no tallow-melting places; nor do triperies, or magazines for hides, appear to be included in the arrangements. The absence of these accessories to the majority of the French abattoirs, is unquestionably an improvement; not so, however, the system of slaughtering in common, which gives rise to frequent robberies, and consequent altercations, amongst the lower classes of workmen frequenting these establishments. E E, are

separate gates, reserved for the removal of the meat in covered carts, and for the introduction of hay, straw, or other fodder, for the cattle; G G G are open pens for the cattle.

Mr. S. Smirke, who has kindly communicated the notes from which this account of the Roman abattoir is prepared, observed, that "there are no drains for clearing the gutters which carry off the blood, except at the end of each building. The slope is almost imperceptible, and not sufficient; it is therefore necessary to keep the gutters clean with brooms, and they are swept by prisoners. It is, however, very difficult to keep the pavement clean."



Fig. 4. View from the gate.

"This abattoir was erected by Martinelli, an engineer, at an expense of from 50,000 to 60,000 scudi, or £12,500 nearly. He has a lease of the tolls for twenty years, and at the expiration of that period the whole building will pass into the possession of the municipality." It has now been erected more than twenty years, so that it is probably in the hands of the government.

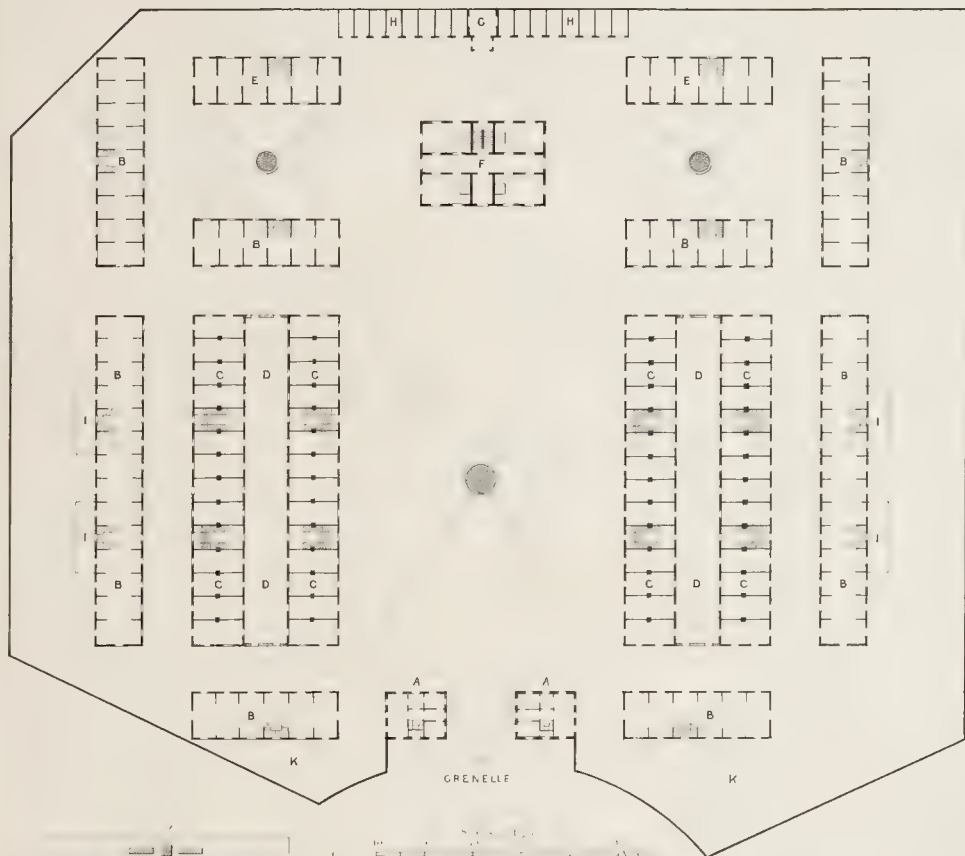
In some of the English country towns, as at Halifax, Liverpool, Glasgow, etc., there are public slaughter-houses, in which the butchers of the town kill and prepare their meat in common. The arrangements of these places are very defective, and they rarely comprehend even the means of securing the necessary degree of cleanliness or of ventilation. For the most part they are constructed in the centre of the towns, and precisely in the quarters most densely populated, from which it is desirable in every point of view, both moral and hygienic, that such establishments should be removed. In the present age of improvement, it is wonderful that more attention has not been paid by our sanitary reformers to this subject; and it must be a source for painful recollection to Englishmen, that in everything connected with the organization of our markets, and the preparation of our animal food, we are far behind many of the civilized nations of western Europe.

G. R. BURNELL.

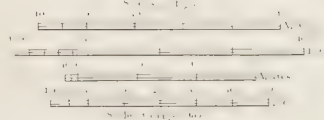
Some further statements upon this subject will be found in BRUYÈRE, *Etudes sur l'Art des Constructions*, folio, Paris, 1823; BIZET, *Du Commerce de la Boucherie et de la Charcuterie de Paris*, folio, Paris, 1840; GOURLIER, BIET, GRILLON, et TARDIEU, *Choix d'Edifices construits ou projetés en France*, folio, Paris, 1826-38; Les Procès-verbaux des Bureaux de la Chambre des Députés sur le sujet de l'approvisionnement de Paris; NORMAND (AINÉ), *Paris Moderne*, etc., 4to. Paris, 1843-48; Various reports of committees of House of Commons upon Smithfield; GRANTHAM, *Description of the Abattoirs of Paris*, 8vo. London, 1850; and some papers by the author of this article, in the *BUILDER* journal, 1850, vol. viii, etc.

ABATTOIR

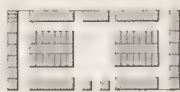
Plate I.



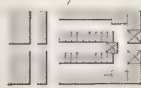
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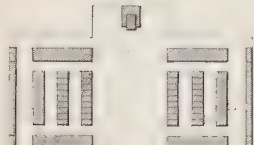
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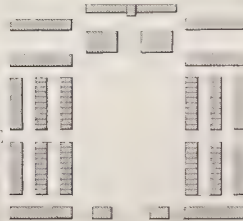
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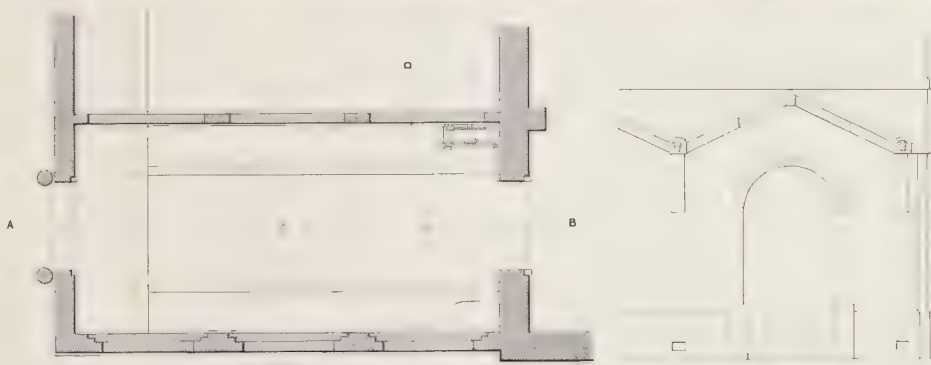
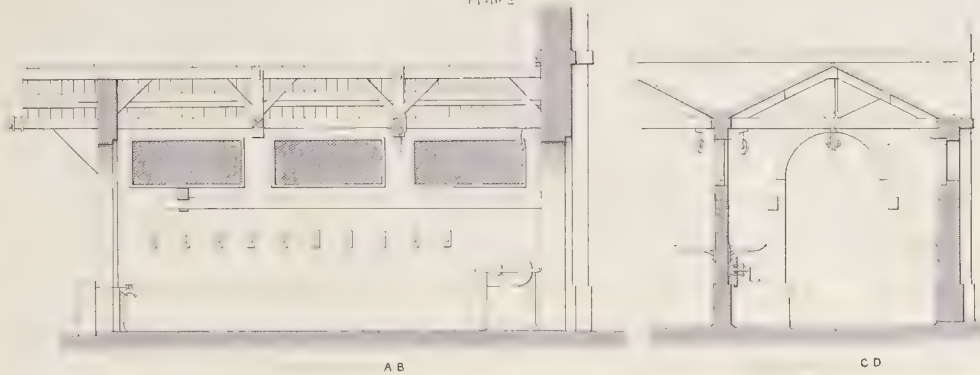


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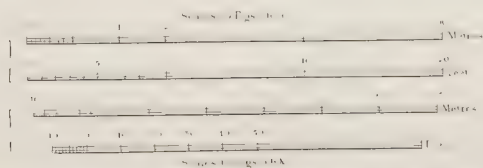
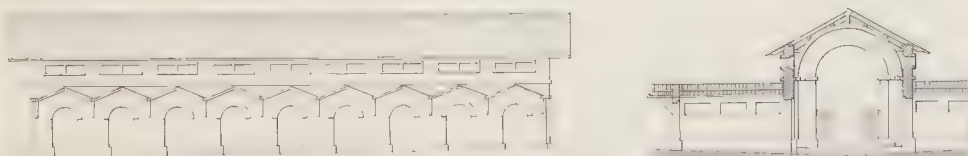
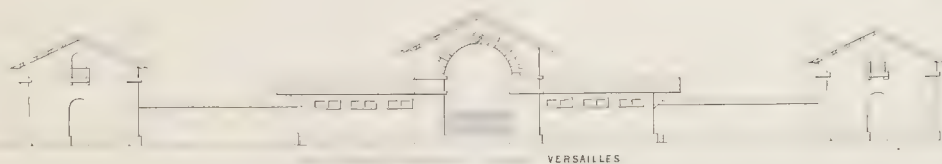


ABATTOIR.

Plate 2



DETAILS OF SLAUGHTER HOUSES





ABATTOIR

Plate 5

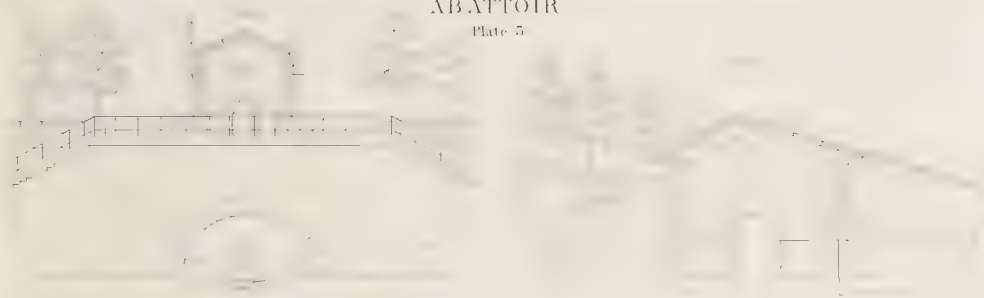


FIG. 1. — ELEVATION OF THE ABATTOIR. FIG. 2. — ELEVATION OF THE ABATTOIR.

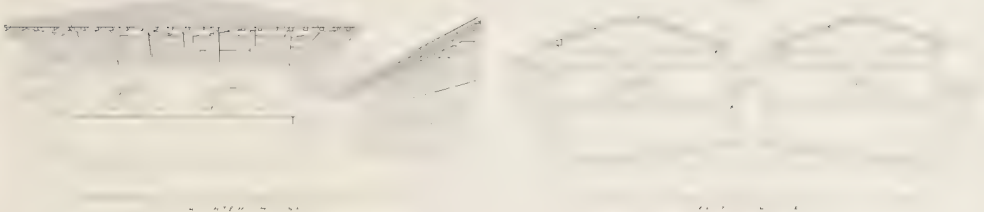


FIG. 3. — ELEVATION OF THE ABATTOIR. FIG. 4. — ELEVATION OF THE ABATTOIR.

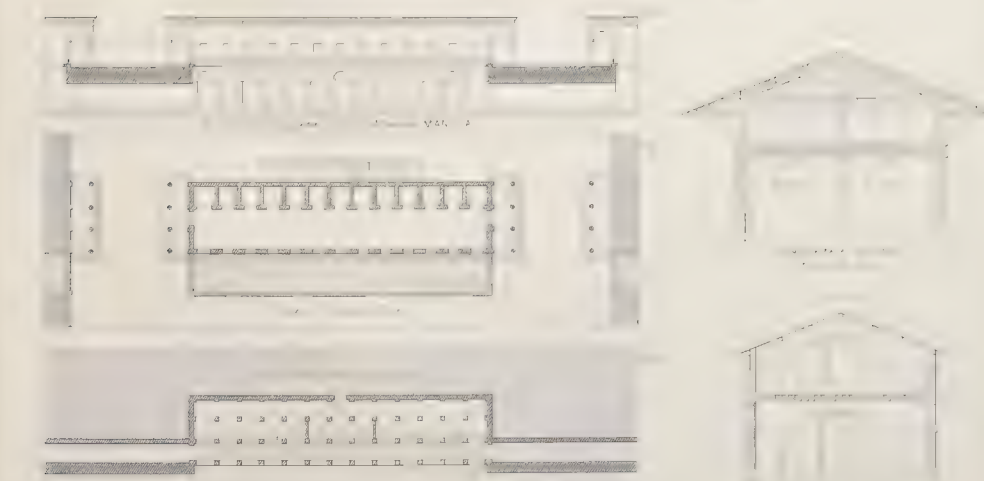


FIG. 5. — ELEVATION OF THE ABATTOIR. FIG. 6. — ELEVATION OF THE ABATTOIR.



AQUEDUCT.

PLATES 84, 85, AND 86.

AQUEDUCT, or aqueduct, as it was formerly and more correctly written, is composed of two Latin words, *aqua*, in the genitive case *aquæ*, and *ductus*, together signifying a conduit of water. It would thus seem at first sight to be the proper designation of any means, not manner, of artificially transporting a continuous stream of water; but the application of the word has been usually confined to structures, which may be described in general terms as conduits, having a regulated fall from the source to the place of delivery, often carried through hills by means of tunnels, and over valleys by bridges, either solid or pierced with arched openings. There is also a secondary limitation, viz., that these constructions should be employed in the supply of water for domestic or ornamental purposes only. Nor can such waterworks be considered in the meaning of the term, as the canal or conduit called the New River in London, those of Central and Southern America, or the subterranean conduits supplying the Fonte Gaja at Siena. These examples are certainly within the strictest limits of the definition of the word aqueduct already given, yet they would not be considered as fulfilling the meaning commonly understood to be conveyed. The term is generally devoted to fabrics, if not entirely on arcades, yet containing in some portion or other at least an important aqueduct-bridge,—fabrics which are interesting alike to the philosopher, artist, and builder, as being the means which gave to Rome and her subject cities, and in many instances still give, a daily supply of one of the necessities of life; as being works in which harmony of proportion pleases the eye, whilst grandeur necessarily results from the arrangement of the mass of materials; and as being constructions which, especially for canal and railway works, have given useful and necessary lessons of experience in boldness of design and solidity of execution.

The subject has also been considered of high importance to the architect, partly on account of the great works already executed, and partly on account of those, which must be constructed, as soon as an immense population is able to comprehend the necessity, and to provide for the execution, of undertakings which are momentous; because the element which they convey is necessary to the very existence, as well as convenience of life (WATER), while the efficiency of the supply is absolutely dependent upon the science and economy of its collection (WATER SUPPLY), transmission (CONDUIT, WATERCOURSE), and distribution (WATER SERVICE).

The disadvantages of mere empiricism, and the care with which these works were carried out, especially by the Romans, form a strong and sad contrast to the present condition of science and to the supineness of governments pretending to a much higher development of civilization, in more powerful and more highly organized communities. It is true, that an idea, of the imperial Roman love of magnificence conjoined to an ostentatious disregard of expense, has been added to a prejudice against the engineering skill of the ancients; the idea and the prejudice have united to form a reason for throwing aside one of their means for the supply of water; and this reasoning has been fortified by the knowledge that they did not enjoy the power of manufacturing large iron pipes, nor the metallic wealth which is now employed.

The inference seems to have been made too hastily, when it

led to the conclusion that the supply through stone or brick channels, with a regulated fall from the head to the place of delivery, would be an unscientific mode at the present time of conveying water from distant sources to large towns, or that it was a mode peculiar to the Romans. The following account will show that all people have more or less adopted it; and the examples of the New York (Croton) and Marseilles (Roquefaveur) aqueducts will prove that the question (a balance of evils) has been very recently decided in favour of the constructed aqueduct over the metal pipe system, by the two people, who claim to be considered, the one as the most economical, and the other as the most scientific, of nations.

A continuous stream of water can only be transmitted artificially in two ways, viz., either by its tendency to find its own level, as in conduits, or by pressure in closed tubes. The various systems of conduits may be classed under six heads:—1. Channels in the earth; 2. Channels in rocks; 3. Channels of masonry above ground; 4. Pierced trees as pipes; 5. Tubes of stone or terra cotta; 6. Pipes in metal. All these materials have at one time or another appeared in the history of aqueducts, and it only remains to follow that history to see what has been done by our predecessors, and also in the present age. Beginning with the ancient remains in Africa, Syria, Asia Minor, Greece, and Sicily, and then passing through Italy and the German provinces to France, Portugal, and Spain, the account will finish with the corresponding undertakings in the New World.

The great works, now called aqueducts as above explained, do not appear to have a claim to date much before the time of Cæsar: the assertions of late French writers compel, however, a notice that, although they speak in vague terms of an aqueduct at Babylon attributed to Semiramis, the Assyrians have left too few traces of their civilization to assist in this inquiry. The same writers cite an aqueduct of Sesostris; Egypt certainly had made at an early period great progress in hydraulic works; the canal from the Nile to the Red Sea, and the irrigation of the land, are incontrovertible testimonies in its favour; but there are no remains to be placed with certainty to its credit long before the time of the Roman domination. After that period, it is known that the solitudes of Asia and Africa were once covered with flourishing cities, whose populousness, and even whose existence, were dependant upon artificial supplies of a perennial stream of fresh water.

AFRICA.

Cherchell or Sersell (Iol or Julia Cæsarea) was supplied from the river Hashem, by a large and sumptuous aqueduct, little inferior to that of Carthage in the height and strength of its arches. The aqueduct of Bujeya or Boujeiah (Sarda) is destroyed. Constantina (Cirta) was supplied from Physgeah, a distance of fifteen miles, by an aqueduct, which, although nearly ruined, still shows a series of arcades in three tiers over the river Rummel: the water ran on the second story, and the highest range served as a bridge.

At Carthage, the sewers and two sets of reservoirs of the aqueducts are the structures which have least been impaired or injured; the earthenware pipes through which the water was conveyed require only to be cleansed. Adjoining to the greater

cisterns are seen the first ruins of the ancient and celebrated aqueduct destroyed by Gelimer, which may be traced as far as Zowan and Zungar, to the distance of fifty-two miles. It has been a work of extraordinary labour and expense; and that portion of it which runs along the peninsula was beautifully faced with hewn stone. STANLEY (*Observations on the City of Tunis, etc.*, 4to., London, 1786) says that the stones were all cut diamond fashion; and the size, 2 feet 9 inches square, is given by SAINT-GERVAIS (*Mémoires Historiques du Royaume de Tunis, etc.*, Paris, 1736). Considerable diversity exists in the accounts given of this great work; the last cited author describes the arcades as 130 feet high, in arches of 18 feet span, on piers 14 feet square, with a vaulted channel 8 feet high by 4 feet wide; while SIR G. TEMPLE (*Excursion, etc.*, 12mo., London, 1835) speaks of much more moderate dimensions, and only allows the arcades, sometimes 98 feet high, to be 66 feet in average height, of very ancient arches 14 feet 1 inch span, on piers 8 feet 6 inches wide by 10 feet 1 inch deep, and of Roman work, probably under Hadrian or Diocletian; also of arches from 15 feet 10 inches to 20 feet span, on piers 14 feet 7 inches wide by 12 feet 2 inches deep, with a channel 6 feet by 3 feet; and he notices, that the piers are built of concrete, in courses 3 feet 6 inches high. The water-mark is nearly 3 feet high in the channel, which is covered. This seems to be the aqueduct of Udena, mentioned by CRESY (*Encycl.*, p. 184), whose article on this subject deserves comparison with the authorities above cited. The portion shewn, Pl. III, Fig. 10, is from the only illustration obtainable of this aqueduct, viz., that given by FISCHER (*Arch. Hist.*, fol., Vienna, 1721), as having been drawn by Barbalonga for Charles V, when at Tunis, where that monarch also built an aqueduct.

One of the most striking features of old Cairo is a plain but magnificent fabric, serving as the head of the aqueduct which conveys water from the Nile to other reservoirs, out of which it is raised up to the citadel by several wheels one over another. The head is a hexagon in plan, of which each face is about sixty-eight feet square; on the upper part are placed six water wheels, turned by oxen. The piers and arches are not of uniform size: the former are mostly about ten feet wide, and the latter from ten to fifteen feet span; in some portions a plain wall is built for several feet without being pierced. The number of these openings (which are all pointed) has been variously stated. Pococke says that he counted "two hundred and eighty-nine arches, though others mention a much greater number, some near three hundred and twenty." A branch of the aqueduct goes southward towards the ancient gardens of El-Besateen, according to HAY (*Illustrations of Cairo*, fol., London, 1840), from whom the accompanying illustration (Pl. I, Fig. 11) is taken. According to COSTE (*Architecture Arabe*, fol., Paris, 1839, Pl. 58), the main line runs for about 10,500 feet in a zigzag direction into a hexagon reservoir like the head, whence the water is again raised, and a continuation of the aqueduct takes it for about 1,050 feet further into a third similar reservoir, from which it is raised into a canal of about 984 feet in length, which runs to the citadel; and again enters a reservoir with wheels to raise it to a height of 279 feet above the level of the Nile. The aqueduct itself is constructed of the usual calcareous stone of Egypt in regular courses set in cement, and the piers are about 45 feet high to the springing of the pointed arches, with about 10 feet more to the bed of the channel. Its foundation has been attributed to Trajan; but the original conduit, supported upon wooden pillars, was constructed by Saladin; and it was only between the years 1503-1518, that the stone aqueduct, still used for the same purpose, was substituted by order of the Sultan El-Ghoorce. The best illustrations of this work will be found in the *Description de l'Egypte*, vol. xviii, part II, p. 465; *planches*, vol. i, pl. 15-21, 26. This book may also be consulted for the small aqueduct with pointed arches visible above ground at Alexandria, as well as for the subterranean conduits which conveyed

the water to the famous cisterns beneath the houses in that city.—*Descr., etc., texte*, vol. v, pp. 302-341; *planches*, vol. ii, pl. 84, 91. Pococke mentions similar conduits at the Alexandrian Nicopolis (Juliopolis), and at Aboukir.

ASIA.

From various passages cited by Pococke, he seems justified in considering that the means of supplying Jerusalem with water do not date later than the time of Solomon: the aqueduct passing traditionally by the name of that monarch is of no great importance, being carried across the valley of Rephaim by nine arches from four to six feet high. His description of the subsidiary works, however, shows the important truths:—1. That the principles of constructing the supply-reservoirs were the same in Palestine at that time as those afterwards adopted in Italy; 2. That where water was taken from running streams, it was collected in basins, one below the other, by means of which the water became clear before its entry into the aqueduct; but that if the water were taken from a pure spring, great care was shewn to collect it in a reservoir constructed to shield it from all damage; and 3. That if the quantity were not too considerable, it was conducted by round earthenware tubes, "about ten inches in diameter, which are cased with two stones hewn out so as to fit them, and they are covered over with rough stones well cemented together, and the whole is so sunk into the ground on the side of the hills that in many places nothing is to be seen of it."

In speaking of his investigation of the two aqueducts which he found had furnished Casarea with water, the same author says, "the lower aqueduct, which is to the east of the other, is carried along on a wall without arches, and of no great height; it is 13 feet thick, and seems to have conveyed a great body of water in an arched channel, which is 5 feet 6 inches wide. This aqueduct, as well as the other, is almost buried in the sand. The other aqueduct, forty yards nearer the sea, is built on arches", ten feet in span (Plate I, Fig. 6); "the side of it next the sea is a rusticated work; but the east side is plastered with a very strong cement, probably to prevent any damage from the sands that might be drove against it." This is remarkable, and is perhaps the only example which remains of this manner of construction; and it might rather be suggested that the western, or sea side, was built in masonry, because the violence of the weather generally comes on that face, while the other side was cemented in order to save expense.

At Acre, in the deep valley below the city, is a stream more than sufficient for the necessities of the place, yet it has been judged convenient to supply water from Mount Libanus. For this purpose, the mountain was united to the city by a remarkable aqueduct, the principal arch of which could not be less than a hundred feet in diameter.

The aqueducts at Tyre are also attributed to Solomon, according to Pococke, who furnishes the accompanying view (Plate II, Fig. 16) and description. The three springs, which are about four miles and a half south-east from the town, and about half a mile east of the sea, rise very plentifully, and "are enclosed with very strong walls about fifteen feet high, by which the water is raised to a sufficient height.—That nearest the sea, D, is of a multangular figure.—The other two springs are marked E and F, and have an additional supply of water from the mountains, and there is an aqueduct from each of them to that which comes from D. They are of an oblong square figure, and the water runs from one into the other, the buildings being contiguous.—The aqueduct, G, which is a very fine one, takes its course in different directions, but mostly northward to a small hill," and thence it goes eastward to Tyre. The aqueduct is justly termed a very fine one; it is without doubt one of the best remains of the ancient Eastern world, and rivals in every respect those constructed in the environs of Rome. If credit may be given to this sketch, the only one to be obtained, it becomes doubtful whether it be a Roman work, because all

the Roman aqueducts are covered, and pierced for ventilation, while these are represented as open.

About ten miles from Palmyra the same observer saw the remains of an aqueduct which probably formerly supplied that important city. He followed its traces as much as possible, and found that it was sometimes tunnelled in the rocks, sometimes built in brickwork and covered with a vault. The channel measured two feet wide by four or five feet in height.

At Tripolis, the greatest rarity is an aqueduct with its reservoirs, some of which are twenty or thirty feet high, and very conveniently supply the greatest part of the houses to their second and third stories. The water runs from the foot of Mount Lebanon about eight miles distant, and is carried along the side of the hills by a channel to the north of the river, until it comes within a mile and a half of the city, when it crosses the valley and river, on an aqueduct of one hundred and thirty paces long and seven feet eight inches broad, serving for a bridge: the two middle arches, which are Gothic, had been probably rebuilt, but the others are fine arches, and seem to be of a more ancient date. Upon the principal arch of the aqueduct, called the Prince's Bridge, there is an escutcheon, charged with what appears to be a cross crosslet, which serves to vouch for the tradition that the aqueduct was built by the crusaders.

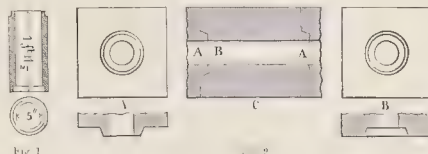
Pococke also cursorily mentions several aqueducts at Hamath, the ancient Epiphania, and states that the aqueducts are the principal part of the antiquities at Antioch. The water was derived from a place four or five miles on the road to Latichea. "It was partly carried by channels of hewn stone under ground along the side of the hill; it runs in this manner about a mile, and then going to a little valley, the water was there conveyed on arches which still remain." (Plate 1, Fig. 1.) These form an aqueduct 865 feet long by 220 feet in greatest height, it is built solid up to 150 feet high, except two small arches of about 20 feet in span, one over the other, near the centre, and over the deepest part of the valley. The upper portion is very irregularly divided into nineteen arches of unequal opening, and sometimes even subdivided into a second range; three of them are also filled in solid. The uppermost tier is built of brick. "The channel afterwards is carried along the side of the hill, and where any waters run, or there is any bed of a torrent, a single high arch is built over the narrow vale. I saw one between this and the stream called Zoiba, where there is a very lofty arch" fifty-five feet in span, and about one hundred feet in height (Plate 1, Fig. 7);—"I saw also two more aqueduct bridges between that and the town, each consisting of a small arch; and at the bed of the torrent, under the western walls, there is one," 200 feet long by 80 feet greatest height, of five arches of 20 feet span, with piers 15 feet wide. (Plate 1, Fig. 5.) At the foot of the south-west hill several arches appear, like small arched chapels, where there were conduits from which water would be drawn for the convenience of several parts of the town. Further to the east, where the hill is steep, a channel is cut along through the rock, about two feet wide and four or five feet high, worked archwise at top; and one may walk in it as in those of Fege, near Damascus. It is to be observed that there were remains of the lower aqueduct near the fountain of Zoiba, about two miles south-west of Antioch, the arches were low and ruinous.

At Old Famagosta, the representative of Salamis in Cyprus: "All the remains which I saw of the aqueduct were Gothic, and there is an inscription on it in Greek which mentions an archbishop. I saw the arches all along the plain extending six or seven leagues towards the mountains to the north-west," obtaining a plentiful source at Cherkese, a considerable way in between the hills.—Pococke.

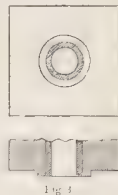
MR. FALKENER has obligingly communicated, from his portfolio of drawings in Asia Minor, sketches of the hitherto unknown aqueducts of Ilamus (Lamus of the maps), in Cilicia (Plate 1, Figs. 2, 3, and 4), and of Aspendus in Pamphylia

ARCH. PUB. SOC.

(Plate 1, Fig. 10): it will be perceived that the arches rising in stages appear to show that this last affords an exemplification of a variety of the tubular system hereafter explained. He has also extracted the following notices of tubes belonging to ancient aqueducts discovered by him. Those at Patara in Lycia were of earthenware, 8 inches in internal diameter and $1\frac{1}{2}$ thick; the nozzle projected $2\frac{1}{2}$ inches, and was three-quarters of an inch thick. He brought one specimen from Ephesus (Fig. 1), and presented it to the Royal Institute of British Architects; as well as another from Priene, which shows how the joints of such tubes were plugged, for remains of the stopping were found. At Cibyra, in Phrygia, tubes in masonry composed of rectangular blocks (Fig. 2), were found by him,



varying from 2 feet to 2 feet 6 inches on the sides of their face, and from 18 to 30 inches long: the internal diameter was 7 inches, and a nozzle 2 inches thick projected at one end as much as that of the earthenware tubes at Patara. At Laodicea, terra cotta pipes $8\frac{1}{2}$ inches in internal diameter and $1\frac{1}{2}$ inches thick, were found in the stone tubes as represented in Fig. 3: the stone was about 2 feet 9 inches square, pierced for a tube of $11\frac{1}{2}$ inches diameter, with a nozzle 2 inches thick projecting $1\frac{1}{2}$ inches. The stones varied in length from 18 to 30 inches.



Laodicea had an aqueduct, which ran along the sides of the hills, after collecting the streams which come from Mount Cadmus, and then was carried through a valley on some arches now ruined: afterwards it crossed a hill, partly on the ground and partly upon arches (a portion of the arcade still remains), was carried through the vale, and ascending the rise upon which the town is built, entered the city at the further extremity of the circus, in two lines of conduits made as above described, and there ran into a reservoir, or what would appear to have been one, as the wall which remains is encrusted with petrifications from the dropping of the water. STRABO says he was informed that the waters of Laodicea were of the nature of those of Hierapolis in making these petrifications, which are also seen in the arches and pipes; the latter have an incrustation on the inside three or four inches thick, and the arches are loaded with this rockwork.

The remains of Hierapolis are opposite to Laodicea, and about three miles to the north of the river Lycus. The side of the hill, where the water ran, is covered with a white incrustation: and the channels, which conveyed it through the city into the plain, formed walls in the street, by the gradual increase of the deposit upon the original conduit until the water could rise no higher; then it was directed into fresh channels, and the old ones could be used as a quarry, all appearing like the solid rock.

"To the south of the great gate at Mylasa, in Caria, there are remains of an aqueduct, which bear no marks of antiquity: but the ancient aqueduct seems to have been carried the same way, and it may be probably on the city walls; for to the north of the gate there is a small low hill, near which there passes an ancient aqueduct, which conveyed the water across the plain, and ended at a small hill towards the other side of it. Most part of this aqueduct seems to have been destroyed, and rebuilt, but not in the best manner": Pococke saw several pieces of an entablature of the Doric order built into it. Where the ground is low

there are two rows of arches, the upper ones being double the number of the lower.

In his examination of the ruins of Ephesus, MR. FALKENER found that in its period of splendour, that city, like all others, had been well provided with water by aqueducts: there remain the traces of two such constructions, one of which came from the north-east, and the other from south-west by west; and a branch. One of these aqueducts is represented in a drawing by him, of the part where it crosses a road near the city, as being of so much beauty in the design and execution of its two tiers of semi-circular arches, as to deserve an illustrative plate to itself.

At Samos Pococke mentions that he did not meet with any information about the Greek channel for water carried through a mountain about 900 feet high, it is supposed by order of Polycrates, to supply the city. The length of the tunnel, according to HERODOTUS (iii, 60), was about 4,260 feet, and its section a square of about 64 superficial feet: the remainder of the text is too corrupt for edification. But Pococke remarks that the remains of an aqueduct were to be seen along the sides of the hills for a league to the west, having its rise at or near the river Imbrasius; the channel for the water was made on a low wall, except in a very few places, where there are the remains of some arches over a valley on the east side of the city; these arches were at least sixty feet high. The pipes for the aqueduct were made of the celebrated red earthenware. He saw some of them from six to eight inches in diameter; and also in Megale Chora the present capital of the island, others of stone bored through, and about the same size.

The aqueduct at Smyrna is undoubtedly very ancient: the first signs of it, "are about a mile to the east of the valley, in which the Meles runs. The high arches are all destroyed, except some part of the wall on the side of the hills, and some remains of the arch over the river." Again, Pococke says, that "the wall is not built with arches, for there is only one arch over the road that goes to the south, and three or four arches near it, where I discovered the channel of the aqueduct in the wall, which was made of large square stones, one stone being let into another, and a round channel is worked through them; what is very particular, this pipe is laid in the wall a very little above the ground, though the wall is built much higher; and in many places where the wall was broke, I could see no signs of the pipes, not even at top, which I therefore concluded run mostly along the ground, except where the ground is low, and yet in all parts the wall is built high. I saw also many pieces of earthen pipes, and one in the wall three or four feet above the ground, which might be a channel from some other source; but it is not easy to conjecture for what purpose the wall should be built so high, unless there was a channel at the top to convey water to higher places; though as the wall is built so thick at the passage of the road with buttresses on each side, and also some towers to it further to the west, one would be inclined to think that it was designed as some sort of defence against the incursions of enemies. To the south of this there is another aqueduct over the vale just under the castle; it is new built with three rows of arches one over another; towards the bottom of it there are remains of an old rusticated wall, after the manner of the city walls, which shows that an ancient aqueduct had been there." A mile to the south there are two aqueducts close to a third which crosses the same valley, each having three rows of arches one over another; one of them is new built, the other, which is a very bad fabric, is older.

At Mytilene, in the island of Lesbos, the same traveller saw, about a mile to the south, remains of a very magnificent aqueduct of grey marble rusticated, built across the valley (Pl. I, Fig. 8). The water having run a considerable way on the side of the hills from the south-west, passed these arches, and then went in channels round to the city. The upper arches are turned with brick. This superb monument rivals any other similar construction; and to give some idea of its pristine glory, it has been restored in elevation (Pl. II, Fig. 10), the line a showing the

level of the earth in 1740. The aqueduct is 500 feet long, by about 75 feet in greatest height, with twenty-four arches of 9 feet in span and 3 feet thick; the piers were 9 feet wide by 13 feet thick, in the direction of the axis, measured at the springing. There are two ranges of intermediate arches in the height of the loftiest piers, to give greater stability, and resist any lateral movement. The precaution appears to have been successful, for notwithstanding the numerous earthquakes to which the Archipelago is exposed, the aqueduct of Mytilene appears to have suffered more from the ravages of man than from those of time.

At Ancyra in Galatia are many stone pipes of aqueducts like those at Laodicea, by which the water ran along on the ground, as it does at present from the river, there being towers at certain distances, in which the water ascends and descends in earthen pipes, to make it rise to the higher parts of the town, which is a method much practised in these countries. When the celebrated Atticus Herodes obtained the prefecture of the free cities of Asia, the young magistrate observing that the town of Alexandria Troas was insufficiently supplied, obtained from the munificence of Hadrian three hundred myriads of drachmæ (about £100,000) for the construction of a new aqueduct, which may be traced for several miles; the piers are 5 feet 9 inches in width; 3 feet 2 inches in thickness, and the arches, though destroyed, were 12 feet high. But in the execution of the work, the charge amounted to about seven hundred myriads (say £235,000), and the officers of the revenue began to murmur, until the generous father Julius Atticus silenced their complaints by requesting that he might take upon himself the whole additional expense.

When Pliny was entrusted with the government of Bithynia and Pontus, provinces by no means the richest or most considerable of the empire, he found the cities within his jurisdiction striving with each other in every useful and ornamental work, that might deserve the curiosity of strangers or the gratitude of their citizens. It was the duty of the proconsul to supply their deficiencies, to direct their taste, and sometimes to moderate their emulation. In the tenth book of his *Epistles*, PLINY mentions the following works, carried on at the expense of the cities: an aqueduct of sixteen miles in length for the use of Sinope, and at Nicomedia, a new forum, an aqueduct, and a canal, left unfinished by a king.—See CRESY, p. 185.

Trapezus, now Trebizond, was indebted to the liberality of Justinian for a church, an aqueduct, and a castle.

The Persians, according to PROCOPIUS (libr. I and 2), built at Petra in Colchis, under Chosroes Nushirvan, A.D. 531-579, an aqueduct which had three conduits one above another and on the same line, similar in these respects to one of those hereafter to be described as existing at Rome.

Even the Monophysite or Jacobite Christians, having retained the habits of their fathers of the sixth century, embellished, after the supremacy of the Mahometans, the pleasant monastery of Zapharan, about three miles from Mardin in Mesopotamia, with cells, aqueducts, and plantations.

EUROPE.

The *Notitia* mentions that Constantinople, about a century after its foundation, possessed eight aqueducts and reservoirs. ZONARAS (L. xiv) mentions the leaden pipes which Justinian or his servants stole from the aqueducts. It is difficult to reconcile this fact with another, that almost every city of the empire obtained the solid advantages of bridges, hospitals, and aqueducts; but the severe liberality of the monarch disdained to indulge his subjects in the popular luxury of baths and theatres.

At present the metropolis is supplied by a conduit from near the village of Papas; by another, commencing near Khalfa, which has a branch, in itself a continuation of two others, and of these one is forked into two lines; by a third, commencing near Kutchuk, and by the two next described.

At Constantinople, says Pococke, they formerly made many

large cisterns as reservoirs of the water of the aqueducts, in case it should fail, and the great cistern under S. Sophia serves for that purpose at this time. The most ancient aqueduct (compare CRESY, p. 185), was built by the emperors Valens and Valentinian; it is seen in three situations; and conveys water ten miles to the city, being brought from places near the village called Belgrade. The three parts of the aqueduct are called the Crooked, the Long, and the High aqueducts. The last is the nearest to Constantinople, and receives the water that comes from the other two, which are different streams. The crooked aqueduct bridge is so called because at one place it makes three turns, one of them an angle of 90° , in crossing the valley, from one hill to the other. "This part is executed in a very fine taste: it is a rustic work, and consists of three tiers of fine arches one over another. The water first runs on a wall, and then over twelve arches for 221 yards; it then turns and crosses the vale on the three tiers of arches, in the lowest there are four arches, in the middle ten, and there are passages made through the piers in the length of the aqueduct, by which one passes to the other side of the valley; in the uppermost tier there are twenty-one arches, the seven or eight first arches on each side are built on the descent of the hill, two or three on the solid wall, and over the middle arches: in the upper story also there are arches through fifteen of the piers, in order to pass the whole length of the aqueduct, as it has been observed there are through the piers of the middle arches; the aqueduct being in that part about 672 feet long, and 107 feet high." The arches of each tier are wider than those below them; the two upper tiers have semicircular, the lowest pointed, arches, which are between 15 feet and 21 feet 6 inches span, on tapering piers from 22 feet to 25 feet wide. "The water is conveyed to it from a rivulet that passes near Belgrade, and is stopped in two different places by a wall built across, so as to make two large lakes, and runs in channels through the wall which is built to keep them up; these seem to be Turkish works. From the last of these their water passes to a deep basin into which some other streams are brought; and from that it runs, partly on the side of the hills, into another basin, and so does the water of the Long aqueduct; and from that basin it goes in one channel to the High aqueduct. The other, called the Long aqueduct, seems to be a modern work, and, I suppose, was built by Soliman the Magnificent, who is said to have repaired the other aqueducts, and if it was, it is a work truly worthy of him; and I saw on it a short Turkish inscription. It was built as a further supply of water to be conveyed by the High aqueduct: it is 2,229 feet long, 85 feet 6 inches high, and the wall is 12 feet thick; it consists of two stories of pointed arches. In the lower story there are forty-seven arches, and fifty in the upper; at the first descent at each end of the hills, the water runs on a long wall. Other streams are brought to this water,

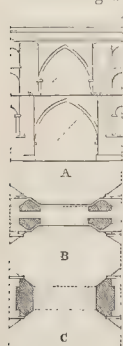


Fig. 4.
A. Elevation; B. Plan of
upper range; and C.
Plan of lower range
of arches.

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by the side of the southern hill, which passes likewise on a small number of arches over the valleys that are in the way. The water of this aqueduct, as observed, communicates with the Crooked aqueduct, and both run to the High aqueduct," or aqueduct of Bourgas (Pl. I, Fig. 9), supposed to be built by Justinian, but surely later in its date; this "is a vast massive rustic building, by which the water is conveyed over a valley. It is above 840 feet long, and 112 feet high; it consists of four large arches, as many over them, and three stories of small ones between them. Fig. 4 shows one of the compartments in an enlarged scale. This aqueduct has a very Gothic appearance, though it is a work of great expense and magnificence, for the walls are 15 feet thick, and the great arches are above 50 feet wide, the piers

being strengthened laterally by a range of buttresses triangular in plan. Ascending by the hill to one of the small arches, there is an arched passage from it through the wall, lighted by pointed openings, consisting of forty-four steps, which leads up to the great arches above, where there is a passage through the piers, as in the Crooked aqueduct, and a descent likewise by stairs at the other end. From this aqueduct the water runs along the side of the hills, in channels covered with stone, there being arches built only in two or three places. This water formerly ran on those arches in the third valley, between the third and fourth hill; but the east part of that aqueduct being destroyed, the water is conveyed in channels on the ground to the several parts of the city." That is to say, the conduit in which the High Bridge, or Bridge of Justinian occurs, is about eight miles in length from the walls of Constantinople to that bridge, and continues about a mile further to the junction of its two sources; one of them lies east of Bourgas and is formed by the junction, about a mile above the Crooked bridge, of two sources which rise about a mile east and west of the village of Belgrade, and the other which lays west of Bourgas contains the Long bridge, and begins about two miles west of Belgrade.

ANDRÉOSSI gives drawings of the Crooked aqueduct and of the following one, built about 1730, "to supply Pera, Galata, and the neighbouring villages. The water at first runs across a valley on a bridge which consists of a great number of arches, that are very well built", indeed they are supposed to be part, constructed by the Greek emperors, of an arcade, about 884 feet long, and 168 feet high, in two tiers, the upper range of which has been destroyed by violence; "and from this the conduit runs round the hills, sometimes under ground, and crossing a low ground it rises in a sort of pillar pipe, in order to keep the water to its level. As it passes, part of it is conveyed to the villages on the west side of the canal of the Thracian Bosphorus, and coming near Pera it rises in the same sort of pillars, and finally runs into a reservoir consisting of many little cells, whence it is distributed over Pera." —POCOCKE.

The Turkish engineers availed themselves of the conduit, and of the remaining arches; but instead of repairing the bridge, they employed the contrivance called *souterazici* by them, but by the Italians *souterazi*; the illustration of which (Pl. II, Figs. 1, 2, and 3), is taken from GENIEYS. Earthenware pipes convey the water from an upper reservoir on a slope down to a bend (Pl. II, Fig. 3), and up another slope into a basin erected upon a pier in the valley (Pl. II, Fig. 2), from which the same operation is repeated as often as may be necessary; and this single operation forms a *souterazici*. The piers are spaced at distances of between 600 and 1000 feet, and the difference of level between the supplying pipe in the reservoir on one side, and the discharging pipe on the other, is about four inches. These basins also served as vent-holes for the pipes, and thus may be seen in practice one of the systems enunciated by VITRUVIUS, which will be noticed preparatory to considering the aqueducts of Rome. A clearer insight into the ramifications of these aqueducts may be obtained from the *Carte des Environs de Constantinople*. Paris, 1829, or from that in ANDRÉOSSI.

Aqueducts are mentioned by STRABO among the erections which were neglected by the Greeks, and first brought into use by the Romans: this statement requires a little modification, for Herodotus mentions, as above stated, the works at Samos; however, it is clear that before the Roman Conquest, the Greeks had no such grand structures, and no need of them. Springs were sufficiently abundant to supply the wants of the population; at least this seems to be better evidenced by the regulations which provided for no greater distance than half a mile between well and well, where there were clay basins, than by the argument that an aqueduct could not be built by people ignorant of arches.

After the conquest we find Atticus Herodes, besides lavishing

C

his treasures upon other splendid works, bestowing aqueducts as well upon Canusium in Italy as upon Olympia. Modern Thebes is supplied with water, conveyed in channels along the ground from the south-east, passing over the valley to the hill on some modern arches; and at Simopetra, one of the most curious of all the monasteries of Athos is built upon a rock rising out of the sea, and supplied by an aqueduct of three stories of arches, conveying to the monks water from the neighbouring height. On the foot of a small, high, rocky hill, about a mile to the north-north-east of Athens, were four Ionic pillars supporting their entablature. On the frieze and architrave was an inscription divided by an arch, and this epigraph may be supposed to mean that Antoninus Pius finished the aqueduct begun by Hadrian in New Athens.

Nicopolis, in Epirus, possessed two sources of water, which would seem to have been sufficient, with the addition of wells, for the supply of the city; but the colonists were not satisfied with the water, either because it lay too low, or did not suit their tastes, and constructed an aqueduct thirty miles in length. Entering the valley of Nicopolis, on the western side of the hill Mikhalitzi, the aqueduct may be traced by means of long rows of piers across the plain of Lamari, and probably vestiges may be found of others for the passage, across the valley of the Luro, of the conduit constructed along the side of the hills, to a point called The Arches, where will be found evidence of the junction of two aqueducts crossing the torrent Ferekisi. One of these aqueduct bridges is destroyed; the other, though in ruins, is 70 feet high, with a double tier of arches, 18 feet wide. Like some aqueducts at Rome, that of Nicopolis, on reaching the city, ran along the walls, and a very interesting plan of reservoirs or fountains within the walls on each side of the great gate, will be found in the plan of the ruins of the city, contributed by MR. DONALDSON to LEAKE'S *Travels in Northern Greece*, 8vo, London, 1835, vol. i, chapters 4 and 5.

Patras and Corinth were also artificially supplied, as were many towns in the islands of Crete and Sicily; at Agrigentum (Girgenti) are the famous works of Phæax, vaunted by the Greeks as being the first of that nature known, and therefore serving as a model for all others of the kind. Heraclea and Himera were also supplied with water from subterranean conduits, as was Tauromenium (now Taormina), upon whose ancient aqueducts several modern ones have at different times been erected. The supply for Catania was conveyed a distance of ten miles. At Syracuse the conduits were all subterranean, cut in the rock, and intended to bring water a distance of nine miles from a place now called Bucemi; and there are many remains of conduits throughout the island.

The most frequently mentioned of the aqueducts in Sicily is that erected, from his own designs, by Don Ignazio Vincenzio di Castel Paterno, prince of Biscari, about five miles from Aderno, on the road to Centorbi, and serving as the bridge for passengers over the valley of S. Paolo, and the river Symete, now called Regalbuto, a little above the place where it receives the Adriano or Trachino. This viaduct of Aderno is 1540 feet long, and consists of two small, and thirty-one large arches, all semicircular except that in the centre, which is 94 feet span and pointed; over this road runs the channel on forty-seven smaller arches, corresponding in arrangement with those of the bridge (Pl. 1, Fig. 12), and extending on each side 3,000 feet beyond it. The greatest height of this work is 128 feet; it was commenced in 1765, and finished in 1777.

ROME.

Some writers have put forward a notion that the Etruscans were the first Europeans to construct these fabrics; if so, the Romans, their pupils, soon surpassed them. Imperial Rome, indeed, at last received 13,773 cubic feet, or 82,500 gallons of water per hour (equal to a current of 30 feet by 3 feet, running

with the mean velocity of the Seine at Paris, or 30 inches in a second of time), from three hundred and thirty miles of channel.

That the Roman builders of aqueducts were much better acquainted with the laws of hydraulics than is generally believed, will hardly be questioned by any person, who studies the monuments by the light of the eighth book of VITRUVIUS, c. 7. There can also be little doubt that the popular ignorance of the sphericity of our planet must have singularly complicated the operations in the field, unless all the aqueduct builders were followers of Archimedes; VITRUVIUS (viii, 6) certainly did not adopt the theory of the sphere belonging to that school. The apparent errors of the levelling instruments must have therefore given rise to empirical corrections, which would naturally sometimes lead to serious mistakes, thus the number of bends sometimes occurring in a line of aqueduct was doubtless due to a fall which proved, by mistake, so great, as to render it necessary to diminish the velocity of the stream, as well as to prepare to enter into the supply reservoirs at a fixed height by means of the bends in question. The materials at their disposal must also have rendered hydraulic works difficult and expensive; yet in spite of these disadvantages, it may be confidently asserted that wherever the Romans solidly and permanently established their dominion, they hesitated at no sacrifice and allowed no difficulty to interfere with the execution of the works necessary to secure a supply of the purest water, which was brought at the public expense to such positions in the centre of their towns as to enable every citizen to procure, easily and gratuitously, all that was necessary for his domestic wants, in an abundance unknown at the present day; while the magnificence of the empire was attested by the baths, reservoirs, conduits or water-houses, and fountains.

As to their arrangements for the reservoirs at the sources it is unnecessary to say much, as no machinery was used by the Romans; the springs were of course sought at such a level as would allow the water, after running down the necessary fall of the aqueduct, to enter the supply reservoir at the needful height. When the source was gained, then, whether it was a river (*flumen*), an open spring (*fons*), or a supply gained by digging a well (*puteus*), a head was constructed for the water, and enclosed with a wall; of course, the quantity could be increased by making channels to this reservoir from other sources; but if no other supply could be obtained than water from roofs, etc., that was led into tanks built with concrete walls, and so arranged as to form deposit chambers (VITR. viii, 8).

Having obtained the fountain-reservoir, the water from it was conveyed in a channel, which involved, on the part of the Romans, operations similar in many respects to the works required in the construction of modern railways, with the additional disadvantage, that the line could only allow of a fall one way, and this the ancients sought to form with as slight, and at the same time as nearly uniform, a slope as possible. The inclination allowed by VITRUVIUS seems to be not less than 1 in 200, while PLINY allows only 1 in 4,800; and the irregularity of the line of some aqueducts could only, as above-mentioned, have been intended to prevent a too rapid flow of the water.

The channel itself, called *forma*, *cuniculus*, *specus*, or *canalis structilis*, by the Romans, was a trough (A, B, C, and D, Fig. 11 and Fig. 14) of brick or stone, lined with cement, and covered: and the water either at once ran in this trough, or in pipes laid in it; these pipes were of lead (*fistuli plumbei*), of stone, of terra cotta (*tubuli fictiles*), of wood (*canales lignei*), PALLADIUS, ix, 11; especially of the hollowed trunks of the alder, fir, and pine, PLINY, *H. N.*, xvi, 42, § 81; or even for the sake of economy, of leather, PLINY, *H. N.*, v, 34, § 2.

When the channel was raised above the level of the ground, the ancients had to carry the *forma*, now generally called *specus*, on solid substructions, or on arched fabrics. Whether

the *specus*, or rather *forma*, was above the ground, or a *rius* on the surface of the earth, whether the *specus* properly so called was carried beneath the surface as a *cuniculus*, a tunnel in rock in which the *canalis* was built, or as a *rius subterraneus* constructed of masonry passing through sand or clay, it was always covered to exclude the sun, the wind, the rain, and any corruptions or obstructions. It was soon found necessary to provide air holes to prevent bursting, and to make the water pass freely; these vents, *spiramina*, were made at intervals in the roof of the *specus*, or, if another channel ran above it, in the side; such are seen in the sections of the triple Roman aqueduct (Fig. 11). To ventilate the portion of an aqueduct carried below the surface of the ground, a well (*puteus* of VITRUVIUS, Fig. 5, representing a common form), was inserted at distances varying from 80 to 120 Roman feet, or 240 according to PLINY, who calls them shafts or *lumina*, (Fig. 6, representing a less common arrangement.) Those wells seen by POCOCKE at Tوما were fifty yards apart, the channel being 10 feet underground. It is remarkable how large a portion of the Roman aqueducts were subterranean, when we consider that although this manner of construction possessed the advantages of being less exposed to the variations of temperature, and more secure from intentional injury, yet it was of course more difficult to reach when reparations were required; the mode of arriving at them by preconcerted openings is shewn in Fig. 7. For the general construction of the *forma*, or *specus*, reference may be made to the aqueducts of Lyons hereafter described.

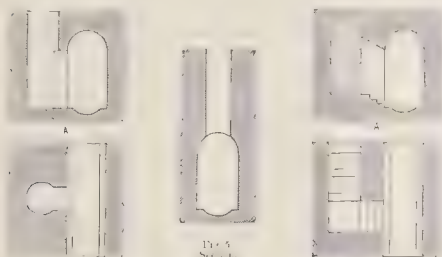


Fig. 6. A Section, B Plan.

Fig. 7. A Section, B Plan.

Lead pipes were perhaps more commonly used than earthen tubes by the Romans, especially for short distances, and considerable ingenuity was shown in their manufacture. Their shape was not perfectly circular, but they were made by turning up plates or *laminae* (laminae) of metal, ten feet long, into a form

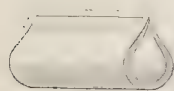


Fig. 8.

represented by the example, Fig. 8: the dotted lines on the illustration show a mode of fastening the pipes which has been discovered in some ancient specimens. Where strength was required, a capping or ridge was soldered over the joint

and hooped round to the pipe, with narrow cuttings of lead. PLINY (xxxiv, c. 48) states that tin was used as the compound to solder conduit pipes, and that the lead brought from England was hammered into sheets for the pipes.

The plates were of a given number of sixteenths of a foot (*digiti*) wide, according to the name expressing the size of the proposed pipe. At least this is inferred from VITRUVIUS, and also that each length of ten feet, at one digit wide, weighed 12 lbs., *i. e.*, the Roman lead for this purpose weighed 19 (or 15, according to CRESY) lbs. to the foot superficial; and that this was the weight for all sizes of pipes, the largest being centenary, and the smallest quinary, of the digits in the sheet. FRONTINUS, however, entering very minutely into the subject, gives (c. 20-63) other calculations.

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When frequent vallies, deep or long, occurred, the pipe-system had the advantage of appearing economical, and of dispensing with an expensive fabric; in such circumstances the pipe was led, (like that at Constantinople above-mentioned, *à souterazici*, viz.,) down one slope, and at the bottom on as long a level substruction as possible, which was called the *venter*; and carried up the opposite slope. VITRUVIUS directs the use of stand pipes (*columnaria*), to lessen the force of the atmospheric pressure; and recommends placing reservoirs at every twenty-four thousand feet, so that, should an accident occur, the injured place might be found without pulling the whole of the work to pieces; of course these reservoirs could never be in the slopes, or the *venter*. He also remarks that if the tube had no *venter*, but came down one hill, and merely turned in an elbow, at once to go up the opposite side, the pressure would burst the pipe at the joints.

Very little was known of the stone and earthenware tubes, except from remains in the Thermæ and the Coliseum, until the communications above detailed by Mr. FALKENER. PLINY (*H. N.*, xxxi, 6) says that the last are best, when two digits (about one inch and a half) thick; that each pipe should have one end tapering for insertion into the next one; that the joints should be cemented; and that, although lead pipes should be used where the water had to rise in them, that the earthenware was better as being more wholesome. VITRUVIUS says distinctly that the tubes should be tongued, the joints made with putty, and that at the elbows of the *venter* the pipes should join a perforated block of red (Collatino) stone; for, he says, in aqueducts, a wind is wont to be created, which will even burst the stones, if the water at the first be not softly and sparingly let down from the head, and unless in elbows or bends it be restrained by means of ligatures or a weight of ballast. All other details are similar to those for leaden piping. When the water was first let in, ashes were put into the tube beforehand, so as to stop the joints more effectually if perchance any were insufficient. The same author also dwells upon the superior salubrity and more agreeable flavour of water out of earthen, over that out of metal, vessels.

The extreme attention given by VITRUVIUS to the subject of the pipes or tubes, may not unjustly lead the reader to suppose, that in the time of that author this method had been chiefly employed; or rather, that the system of building aqueducts upon arches had not yet been adopted to any considerable extent: whence it may also be inferred that experience on a grand scale has already once shown, that such constructions are in many respects preferable to other methods of conducting water, in a country secure from war.

The Romans placed at convenient points, especially near the middle and end of the aqueduct, deposit reservoirs (*piscinae limariae*, *piscinae limosae*), for the purification of the water from any sediment which it might hold

in suspension; one of these reservoirs is given in Fig. 9: that they were not always used appears from noticing that the Aqua Virgo and Aqua Alsietina did not possess them; indeed they were chiefly necessary when the water ran through pipes.

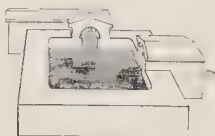


Fig. 9.

The *castellum* was the supply-reservoir, and there is a little difficulty in this term, which may be obviated by dividing it into two classes, major and minor. The larger *piscinae* also served as reservoirs for the adjacent country, for the purposes of irrigation, etc., and were properly *castella* if above ground, *piscinae* on the level of the soil, and *cisternae* if sunk in the earth. In all cases they should be understood to be covered with a vaulted roof, sometimes supported by pillars, like the remarkable examples at Constantinople.

These reservoirs were formed by one or more chambers, *conceptacula*, one of the usual arrangements is shewn in Fig.

10, where the water of the Aqua Virgo flows into A, sinks into n, and passing into c, rises to its level in d, whence it resumes its flow in the conduit. Among the great reservoirs of Rome may be counted that near the Colosseum, another near the Porta Maggiore (both supplied probably from the Aqua Claudia), another of nine cisterns, commonly called the Sette Sale, near the Baths of Titus, and another for the Baths of Helena under the Villa Conti.



Fig. 10.

The reservoir of the Aqua Marcia, called the Cento Celle, is situated between the Marcian and Claudian aqueducts, about four miles from Rome on the Via Latina. All the aqueducts which had *piscinæ* were measured within seven miles of the city; and this leads to the consideration of the minor *castellum*, chateau d'eau, conduit, or water-house, of which the more ancient name in use when the aqueducts were first constructed was *dividiculum* (Fest., 1, 5): into this the water flowed from the main or branch conduit, and was conveyed from it through pipes of fixed dimensions into three smaller *receptacula*, so arranged that one was supplied by the overflow of the other two; which supplied respectively the baths, and private houses, while the third was devoted to the public ponds (*lacus*) and fountains (*salientes*): thus in case of scarcity luxury would first suffer, and at all times an account would be kept of the quantity supplied for private use, so as to decide the amount of revenue to be derived from this source. The Trophies of Marius, supplied by the Aqua Julia, may be taken for an example of the *dividiculum*; it is given by CANINA, as restored by the modern architects, Plate CLXXI.

The *castella* were further divided into classes, viz., those for the supply of the Prætorian camp; of the *lacus* and *salientes*;

of gifts to the public, as Naumachia, etc.; of public wants, as baths, dyers, fullers, etc.; of the prince; and of gifts to individuals.—FRONTINUS, III, 78-86.

Fig. 11 shows a *castellum* attached to the Aqua Marcia, c. The water flowing into a chamber descends into a lower one, supplying the Rivas Herculeane, d. The *castellum privatum* was for the supply of private houses, and it was built at the expense of the families supplied by it; but it was considered public property, and was under the control of the *curatores aquarum*.—FRONTINUS, 27, 94-111.



Fig. 11.

The *castellum domesticum* was the leaden cistern which each person had in his own house. The details of these points and of the establishments devoted to the care of the aqueducts, are given, *sub voce*, by SMITH (*Dictionary of Greek and Roman Antiquities*. 8vo. Lond., 1849).

The writers on the present subject have generally proved themselves descended from one common origin, viz., FRONTINUS, who, about the year 98, having received from the Emperor Nerva the charge of superintending the water supply and service of Rome, was impelled to write his observations after a minute investigation of the sphere of his new duties, in which he was to be assisted by two architects and several subordinates. Following his own system, attention will first be given to the various aqueducts themselves, and afterward to some of the results of his examination.

In order to show clearly the number and names of the aqueducts of Rome mentioned by various authors, the following table has been prepared. Those of the present day are so intimately connected with the ancient works as to render it necessary to consider them at the same time.

Date (A.D.)	Twelve of 1st century	Fourteen of 2nd century	Nineteen of 3rd century	Twenty of 4th century	1st to 10th century	BUILDER.	On the Ground Miles.	Above Miles	Total Above ground Miles.	Total Under ground Miles.	Total Length Miles.	SOURCE. (NEAR)
312	Appia	Appia	Appia	Appia		{ A. Claudius Crassus } { C. Plautius Venox }	..	0-000	0-000	11-130	11-130	7 m. of V. Prænestina
272	Anio vetus	Anio vetus				{ M. Curius Dentatus } { M. Fulvius Flaccus }	..	..	0-221	42-771	43-000	A branch { Tivoli, about 20 mile of V. Tiburtina }
115	Marcia	Marcia	Marcia	Marcia		Q. Marcius Rex	0-528	0-035	7-403	51-247	61-710	36 m. of V. Sublacensis
136	Tepula	Tepula	Tepula	Tepula		{ C. Servilius Cæpio } { L. Cass. Longinus }	..	..	..	..	..	Branch near the head
34	Julia	Julia	Julia	Julia	Marrana	M. Vipsanius Agrippa	0-528	6-472	7-000	6-420	15-428	10 mile of V. Latina
22	Virgo	Virgo	Virgo	Virgo	Vergine or (Trevis, 1447-1970)	M. Agrippa Agrippa (Nicholas V & Pius V)	0-540	0-000	1-240	12-065	14-105	13 mile of V. Latina
21	Alsitina, que et Augusta	Alsitina	Alsitina	Alsitina	Alsitina, que et Augusta	Augustus	..	0-358	..	..	22-172	8 m. of V. Collatina
21	Augusta	Augusta	Augusta	Augusta		Augustus	..	..	..	..	22-172	At Lacus Alsietinus
A.D. 30	Claudia	Claudia	Claudia	Claudia		Caligula and Claudius	0-609	9-567	10-176	36-210	46-406	Source of Marcia
51	Anio novus	Anio novus	Anio novus	Anio novus		Claudius and Nerva	..	..	9-100	49-300	58-700	36 m. of V. Sublacensis
54-68	Nero	Nero	Nero	Nero		Nero	..	1-261	1-261	..	1-261	42 m. of V. Sublacensis
112	Traiana	Traiana	Traiana	Traiana		Trajan	..	..	..	..	..	{ From Claudia and Anio Novus at Porta Maggiore }
135	Septimiana	Septimiana	Septimiana	Septimiana		Septimius Severus	..	..	..	..	..	At Lacus Salustianus
203	Severiana	Severiana	Severiana	Severiana		Septimius Severus	..	..	..	..	..	From Trajana
211	Antoniniana	Antoniniana	Antoniniana	Antoniniana		Caracalla	..	..	..	..	..	Li Fratochi
212	Algentiana	Algentiana	Algentiana	Algentiana		Caracalla	..	..	..	..	..	From Marcia
236	Alexandrina	Alexandrina	Alexandrina	Alexandrina		Alexander Severus	..	..	..	..	..	Mons Alaticus
274	Aurelia	Aurelia	Aurelia	Aurelia		Aurelia	..	..	..	..	..	{ Ponte Sicula, near 14 m. of V. Prænestina }
274	Annia	Annia	Annia	Annia		Annia	..	..	..	..	..	From Trajana
274	Ciminia	Ciminia	Ciminia	Ciminia		Ciminia	..	..	..	..	..	At Lacus Ciminus
274	Herculea	Herculea	Herculea	Herculea		Herculea	..	..	..	..	..	From Marcia
590	Salustiana	Salustiana	Salustiana	Salustiana		Symmachus	..	..	..	..	..	At Lacus Salustianus
1585-90	Paula	Paula	Paula	Paula	Felice or (Symmachus)	Sixtus V	..	7-000	7-000	15-000	23-000	Branch of Claudia
1612-74	Paul V & Clement X	Paul V & Clement X	Paul V & Clement X	Paul V & Clement X	Paula	Paul V & Clement X	..	..	..	..	..	14 m. of V. Prænestina
							..	..	..	..	..	At Lago di Bracciano

As the aqueduct is often simply called *aqua*, so the *aquæ* have often been supposed to be aqueducts; this however is not the case. The fountains, etc. (*salientes*, *lacus*), appropriated the name, as the Aqua Jovia, Juturna, Mercurii, etc. Auxiliary sources to the great aqueducts also enjoyed the same title of *aqua*, as the Albulina, which belonged to the Claudia; the Augusta,

which was applied to a part of the Appia, the Claudia, the Marcia, and of the Anio Novus; the Carulea, also Cyanea, supplied the Claudia, as did also the Curtia; and one Herculeana was a source of the Anio Novus.

Parts of some of the leading aqueducts took a separate name. Thus one Antoniniana was a branch of the Marcia at the arch

over the Via Collatina, to supply the baths of Caracalla; another Herculanea was a rivus of the Marcia, supplying the Caelian Hill; the Octaviana was a part of the Anio Vetus, and ran from a piscina two miles distant from Rome, over the arch of Drusus into the region of the Via Nova; and the Septimiana, derived from the Anio Novus, supplied (FABRETTI) the village now called Statuario, but CASSIO calls the supply, the Severiana.

Critics are not agreed upon the precise locality of the Amnia or Annia, which was probably the Anio Vetus; or of the Capitolina; the Labicana; the Petronia; the Salonia; the Setina; the Severiana. Several of the leading aqueducts were certainly known by more than one name, thus the Aufeja (not Aupeja) was the old title for the Marcia; Augusta is a title given to the Alsietina, as being a work of Augustus; Aurelia was Trajana; Cælimontana was the water carried by the Neronian arches; Damnata was an epithet given to the Crabra; Ciminia and Sabatina seem to have been the Trajana; and the same event has occurred in modern times, for the Sistina is another name for the Felix, as the Trevia is for the Virgo.

Aqua Alexandrina ran in its own aqueduct on handsome arches, erected by Alexander Severus to supply the baths built by him next to those of Nero, near the present Piazza Madama. The source was gained in the lands of Tusculum, about fourteen miles from Rome, between Gabii and Lake Regillus; and FABRETTI wrote his learned treatise to prove that the reservoir of the Acqua Felice received its supply from the same springs as those which had formerly filled the Alexandrina. Considerable remains of the *opus arcuatum* still stretch across the Campagna, and appear to be composed entirely of beautifully worked brickwork, in arches of a single (Roman) brick ring, when low and near the source, as in the valley of Pantano, where their span is about 10 feet 6 inches, and of a double course everywhere else; the height being sometimes 70 feet and the span of these arches 12 feet; where the height was too great for a single arch, the aqueduct was constructed in two tiers of arcades; each arch having a *supercilium*, or tile cresting, by way of hoodmold or architrave. (Plate II, Figs. 12, 14 and 15.) FABRETTI gives its elevation, piscina limaria, puteus, and spiramina. The piers, which are eight feet square, are built of concrete, faced everywhere with brick: the work is much dilapidated, and in some places the *specus*, or rather *forma*, has been taken off, and the Crabra led in a rivus dug in the mass, but in a contrary direction to the original fall. The *forma* or channel was 2 feet 6 inches wide and 4 feet 6 inches high to the springing of the vault, whose rise was 1 foot 3 inches; the side walls were 2 feet 3 inches thick.

A. Algintiana is stated to have come from Mons Algidus, a course of about sixteen miles and a half: according to FABRETTI, the aqueduct first appeared about nine miles from Rome, and passed by the Torre Mezza via di Frascati, where there remains a part in arcades: the builder is unknown, but CASSIO suggests Caracalla.

A. Alsia is Alsietina, or rather one half of the word supplying the deficiency of Setina in the list of the Notitia. The Alsietina, also called Augusta, was on the right bank of the Tiber, and was brought, although the water was very bad, from the Lacus Alsietinus, now Lago di Matignano, which lay 6,500 paces to the right hand of the fourteenth mile-stone on the Via Claudia, by Augustus, for the supply of his Naumachia in the Trastevere. Its aqueduct, rediscovered in 1720, was 22,172 paces long, of which 358 were in arcades built of tufo. It was restored by Trajan, who introduced the Ciminia and Sabatina, or Trajana, near Carejas. The great reservoir of the Alsietina was 1,800 feet long by 1,200 feet wide.

A. Anio Novus was originally built by Claudius, and was taken, as FRONTINUS observes, from the river of the same name, which running in a rich soil amongst cultivated fields, was always troubled and charged with mud during the rainy seasons: although a *piscina limaria* was constructed at the entrance of the river water into the aqueduct, yet whenever there was rain,

the supply was always troubled on its arrival in the city: Nerva therefore ordered a fresh supply to be sought twenty-two miles further away from Rome, and thus this became the longest of all the aqueducts in the Campagna. It began at the forty-second milestone on the Via Sublacensis, and at the thirty-eighth received the Rivus Herculaneus; FABRETTI questions whether the Septimiana was not derived from it: besides supplying Rome, the Anio Novus supplied a village in the place now called di Sette Bassi, by a series of arches 600 paces long. Its total length was 58,700 paces, of which 9,400 only were above ground, and of these last 609 near the city were substructions, and 6,491 in arcades; the remaining 2,300 among the hills being partly arcades and partly substructions. The Anio Novus ran just over the Claudia, on the same arcades near Rome, but before it arrived at the piscina or castellum where it was measured out, it was everywhere forty feet above it; the arcades are the highest in the Campagna, being in some places 109 feet above the level of the ground. Its channel may still be seen above that of the Claudia in the Porta Maggiore, where Vespasian and Titus are mentioned in inscriptions as having restored it.

A. Anio Vetus was begun, B.C. 272, by Manlius Curius Dentatus, and finished by Marcus Fulvius Flaccus, with the proceeds of the spoils taken from Pyrrhus: it commenced at the twentieth milestone on an ancient road above Tivoli, and supplied the Tiburtines with a portion of its current. The aqueduct called Octaviana also drew its supply about two miles from Rome from this channel, while the true Anio Vetus ran near the temple called Spes Vetus, within the Porta Esquilina. In order to maintain the level of its stream, the length of the aqueduct was 43,000 paces, of which 221 were above ground. There are considerable remains of this aqueduct near Tivoli, and on the walls of Rome; it was built of peperino, and the channel lined with a coating of cement. The Anio Vetus was crossed by the Marcia, having a difference of six feet between their levels at the corner of the streets leading from the Circus to the Porta Ostiensis and to the Church of S. Balbinus.

A. Appia was the first aqueduct constructed by the Romans, who until the year 313 B.C. had been content with water drawn from the Tiber, and from a few wells within the city; but in the subsequent year the necessary works were commenced, in consequence of the exertions of the censor Appius Claudius Crassus, who had for his colleague C. Plautius, surnamed Venox, on account of his skill in discovering veins of water for this supply: consequently the Romans did something more than simply lay prone upon the ground an hour before sunrise, as Vitruvius mentions. This construction began in the domains of Lucullus, now Casal di Rustica, about 780 paces down a bye road on the left hand, between the seventh and eighth milestones on the road to Præneste; and ran 11,190 paces to the Salina near the Porta Trigemina, in a subterranean channel, except for about 60 paces in arcades near (not upon) the Porta Capena. Two other springs or brooks united themselves to this supply, one being 980, and the other 6,380 paces long; and this last was one of those called Augusta. The *specus* and *canalis* of the Appia, as discovered about the year 1680, are given by FABRETTI.

A. Ciminia probably ran from the Lacus Ciminus, now Lago di Vico, near Ronciglione, into the Alsietina.

A. Claudia, the best in quality after the Marcia, was founded by Caligula and finished by Claudius, A.D. 51. Its sources were the Fontes Cærulea and Curtia, about 300 paces down a bye road near the thirty-eighth milestone on the Via Sublacensis, and in its course it also receives the streamlet Albudina: there was also a feeder called Augusta, which served both this and the Marcian aqueduct. This work was 46,406 paces long, of which only 10,176 were above ground, 609 being substructions, and 9,567 on arcades. Of this magnificent work, a line of arcades no less than six miles in length, built of squared stone, still bestrides the Campagna, forming the grandest ruin beyond the walls of Rome. Its *specus* was 4 feet 2 inches wide by 6 feet

high, with sides 3 feet thick: its arches were 21 feet span, on imposts projecting 1 foot 6 inches from the piers, which were 14 feet on the face, and 12 feet deep, with only 20 feet between the imposts: the arch itself was 10 feet 6 inches deep from front to rear, and 2 feet 9 inches in thickness. Stone was the only material of construction. The Anio Novus ran above it near Rome: Septimius Severus and Caracalla are recorded as having restored it; and pope Sixtus V availed himself of the arches for his Acqua Felice. A branch ran from the Claudia to near the sepulchre of Cæcilia Metella; and FABRETTI saw portions of its ruins at Acqua Santa, formerly Ad Camenas: and the water which ran on the Arcus Neroniani also came from the Claudia.

A. Crabra was a subterranean channel, whose source was near that of the Julia, and it was originally carried right through the Circus Maximus, although the water was so bad that, as Agrippa would not bring it into the Julia, it was called Damnata: in later times it was carried on part of the line of the Alexandrina, and, under the name of Marrana, received the water of the Julia and Tepula. The traces of the channel begin at Li Centroni, nine miles on the Via Latina.

A. Felix or Felice was so called by pope Sixtus V, not so much from the success which attended its construction, as from his name (Felix) before the pontificate. It rises near the Osteria di Pantano, about fourteen miles out of Rome on the road to Palestrina, where FABRETTI places the source of the Alexandrina also, and runs in a subterranean channel to near the Torre Mezza Via di Frascati, where it takes the Claudian aqueduct.

A. Julia was conducted to Rome B.C. 34, 35, or 37, by M. V. Agrippa, from a source very near that of the Tepula, two miles to the right of the twelfth milestone on the Via Latina, in an aqueduct 15,426 paces long; 7,000 paces being above ground, of which 6,472 were in arcades. It is supposed to have run first to the Tepula, and to have been merged in it as far as the reservoir on the Via Latina, seven miles from the city. Thence it was carried along two distinct channels on the same substruction, which probably was that of the Tepula restored; the lower being called Tepula, and the upper Julia; and these again ran on the Marcia after the junction of all three at the Porta S. Lorenzo. In walking along the Via S. Bibiena towards the church of S. Eusebio, six of its arches may be seen on the right hand, and some remains on the left. It supplied the *dividiculum* called the Trophy of Marius, which also served for the Claudia and Julia. Its traces are nearly lost after its junction with the Felix.

A. Marcia, once called Aufeja, was conducted to Rome B.C. 145. An aqueduct with an unusually large canal was desired, and 8,400,000 sesterces (£45,700) were granted to Quintus Marcius Rex for its execution. Its source was the Fonte della Mola, "Fons ipse Pitonia" of Pliny (xxxi, 3), at the extremity of a byeway 3,000 paces long, which met the Via Valeria on the right hand, and the Via Sublacensis on the left, at the thirty-sixth milestone on each. Antoninus Pius added to the supply a spring called Augusta, afterwards turned into the Claudia, and the branch called Antoniniana was an addition at the arch over the Via Collatina, made by Caracalla to supply his baths. The total length of this aqueduct, from its source to the city (Rome), was 61,710½ paces; 54,247½ in subterranean conduits, and 7,463 in substructions above ground: of these, 463 paces were arcades in the several places where the valleys occurred, 528 formed a canal above ground, and the remainder, or 6,472 paces, expressed the length of the arcades near the city, necessary to conduct the water to the Capitol, the most elevated spot in Rome.

This portion is that magnificent line of arches, which still forms so grand a feature of the Campagna, and many persons see in it the style of construction practised in the time of the Republic; but there are strong reasons for believing that, except the foundations, the greater portion of the existing work belongs to the time of Augustus, who repaired all the aqueducts of his era; in fact, it is almost impossible to distinguish the original from the additions and restorations made during the early period of the empire. The rivas, 2 feet 6 inches wide by 5 feet 6 inches

high, with sides 1 foot 3 inches thick, was restored by Titus. The arches now standing are built of peperino. Near the Arco Furbo, on the road to Frascati, the aqueduct is crossed by the Claudia, which runs parallel to it in some places. The Marcia crosses, at a height of 6 feet, the Anio Vetus, at the angle of the streets leading from the Circus Maximus to the Porta Ostiensis and to the church of S. Balbinus, and close by that place the Appia was seen 28 feet below the Anio Vetus. The Marcia stopped upon the Porta Capena; but a portion ran to the Cælian Hill, in the *rivus* called Herculanea, after leaving the Pallantine gardens. The water of the Marcia now runs into the Virgo or Trevia.

A. Mariana, probably a misprint for Marrana, is the Crabra and Damnata, which rises near Marino and Grotto Ferrata, and falls into the Tiber after running through the Circus Maximus.

A. Neroniana, or Cælimontana, is a convenient appellation for a branch of the Claudia after the Anio Novus had been joined to it in the time of Nero, and mentioned by FRONTINUS as commencing "ad Spem Veterem", which must therefore have been from near the Porta Maggiore, where its admirable construction in the "lateritia" or brick work, so highly praised by Vitruvius, will be best seen and appreciated; taken as a specimen of the age of Nero, Rome at this day offers nothing parallel. The specus is 2 feet 6 inches wide by 5 feet 6 inches high to the springing of the vault, which rises 1 foot 6 inches higher, the sides are 1 foot 7½ inches thick, on an arcade consisting of arches varying in span from 18 feet 6 inches to 27 feet 6 inches; the inner ring of the arch was 2 feet deep, the outer ring was 1 foot 3 inches, projecting to form an archivolt; the piers were 7 feet deep by 8 feet on the face. From the Porta Maggiore, the arches may be followed in continued preservation to near the "Santa Scala", and again partially across the Piazza Laterana; they are seen again in the deserted Via S. Stefano, and finally in the Piazza Navicella, near which place as a continued aqueduct it ended. But from the place where FRONTINUS says it thus ended, there began other branches, which conveyed the water to the Palatine and Aventine hills, and even across the Tiber; of these branches, some remains projecting from the mass of the stupendous ruins of the palace of the Cæsars towards the Cælian hill, may have been one, made or repaired after the time of Nero. The above described great work was properly known by the name of the Neronian arches, doubtless because it was first constructed by Nero, for the purpose of conveying water to his golden house and extensive gardens. Its original appellation does not seem to have long survived the tyrant; for it appears by an inscription given by GRUTER, (tom. i, p. 187,) that Septimius Severus repaired the aqueduct then called the Cælimontane Arches. In the solitary Via S. Stefano will be remarked the solid construction of the aqueduct, and with a little consideration the repairs of Severus will be easily distinguished from the original work of Nero. In the gardens of the convent of the Passionists may be seen the termination of the aqueduct; also some additional arches of a date posterior to Nero's work, these are perhaps some of the repairs made by Septimius Severus. Its *piscina* or *stagnum* is carefully detailed by BURGESS.

A. Paola consists of the water gathered from the territories of Arcoletto and Baccano, which were conducted in the ancient aqueduct of the Alsietina by Paul V, under the direction of Giovanni Fontana; afterwards a new supply from the lake Bracciano was added to it by Clement X, in 1674, under Carlo Fontana. About one-third of the quantity of water furnished goes to the Vatican, where it supplies the fountains of the Piazza di S. Pietro, and those of the Pontifical palace; the remainder is distributed in eight public, and twenty-three semi-public fountains, and in twenty-one taps in the Via S. Pancrazio.

A. Tepula was introduced by Cneius Servilius Cæpio, and Lucius Cassius Longinus, B.C. 126, from a source near Tusculum; after it joins the Felix its traces are nearly lost.

A. Trajana, which entered the Porta S. Pancrazio after a course of two miles along the Via Aurelia, was probably the Sabatina, Ciminia, and Alsietina in one channel.

A. Virgo was conducted to Rome, according to FRONTINUS, about the year 22 B.C., by Marcus Vipsanius Agrippa. In the city it was conveyed on arches, commencing in the gardens of Lucullus and ending in the Campus Martius, in front of a public building called the "Septa", and from thence supplying the baths of Agrippa: the date (9th July) has been preserved on which the water reached the city. This aqua, which now supplies the Piazza di Spagna and the Fountain of Trevi, has its source near the river Anio, about eight miles from Rome, on the left hand of the ancient Via Collatina; where its springs are enclosed within a space formed by brickwork covered with cement. It is augmented by other veins, and arrives at Rome by a channel 14,105 paces in length, 12,865 being subterranean works, and 1,240 above ground; of these 540 in various places were substructions and 700 in arcades: 1,405 paces more must be added for the underground channels belonging to the minor conduits. This water, in its passage, runs through the garden belonging to the church of S. Trinita de' Monti, at an immense depth; it is possible to descend to it, but with considerable difficulty. The arches described by Vitruvius therefore began where the water issued from the Monte Pincio, and they may be partially traced from there to the fountain of Trevi. The conduits or channels of the Aqua Vergine or de' Trevi having been damaged, its repair was commenced under the pontificates of Nicholas V and Sixtus IV, and finished under Pius V in 1570. In continuing along the Via della Stamperia, vestiges of the original aqueduct may be traced behind the houses on the left-hand side of the street; but attention will chiefly be directed to a portion of the arches mentioned by FRONTINUS, which remain unimpaired since his time. In the Via del Nazareno, one side of the arches may be seen by descending into a washing-house; but the other side remains still more perfect in the court-yard of the Palazzo del Bufalo, which is situated nearly opposite the entrance into the Collegio del Nazareno. The large and legible inscription written upon travertine stone, and given by BURGESS, shews that Claudius restored these arches from the foundations after their dilapidation by Caligula.

For details of the leading aqueducts, and for a map of the Campagna showing their probable course, etc., the reader is referred to RONDELET's edition of FRONTINUS.

The levels at which the several conduits delivered their water, *i.e.*, the different heights of the aqueducts, were ranged in the following order by FRONTINUS; the mean level of the Tiber is 91 feet 6 inches above the sea, according to CRESY (*Encyc.*), from whose measurements compared with those of FABRETTI, it appears that the following are the actual heights of the bottom of the channels above the datum line of the Tiber above given. Anio Novus, 158.88 feet; Claudia, 148.9 feet; Julia, 135.5 feet; Tepula, 130.7 feet; Marcia, 124.5 feet; (these three arrived at the city in one aqueduct); Anio Vetus, 82.5; Virgo, 34.2; Appia, 27.4; Alsietina was still lower. The top of the external covering of the Aqua Felix is 5.79 feet below the bottom of the Claudia; according to GENIEYS, the Paola is 210 feet, and the Felix 176 feet above the summer level of the Tiber.

Six of these aqueducts were led to covered reservoirs, termed *piscine*, near the seventh milestone on the Via Latina, in which to deposit their sediment; the quantity of water being also then determined by the measures placed there;—neither the Virgo, Appia, nor Alsietina had this sort of reservoir. These last streams being of inferior quality, were only used by the Romans for the gardens, for cleaning and watering the streets in summer, and for similar common purposes. The use of these reservoirs is rather remarkable, because, had the aqueducts been constructed with wells, there would have been no need of reservoirs, which were at any rate insufficient to render the

water as clean as it might be; and FRONTINUS was himself perfectly convinced of this fact.

I have myself constructed a little conduit in earthen pipes, of about 700 feet long, at Weesp, a small town about nine miles from Amsterdam, on the banks of the river Vecht, whence the needful soft water is brought to Amsterdam in boats; and having constructed in this length of pipe five such wells, I have found by experience that the water was delivered extremely pure, even when it was troubled in the river at the head.

After having mentioned the duties of the public towards the aqueducts, FRONTINUS relates the duty of governments as regards their surveillance and repair. The paragraphs following the above, namely, the 121, 122, and 123, are sufficiently important to be given entire.

"The aqueducts generally fail through age and violence of storms; especially when they are carried upon arcades, or when they are built on the sides of hills. The portions in arcades which suffer most, are those which span the rivers. The subterranean channels suffer less, because they are not exposed either to frost or great heat. The repairs to be made to the channels are sometimes occasioned by the sediment attaching itself to the walls, and in time forming hard and thick concretions which obstruct the passage of the water, or sometimes by the failure of the linings, which occasions leakages, to the damage of the walls of the channel and the supporting masonry. The piers supporting the aqueducts should not be built with tufo, because this material crushes under such a weight. Although the right season for building operations is from the beginning of November to the end of March, it is proper to suspend the repairs during the height of summer, because great heat is not less injurious than frost, and it is desirable to have a moderate temperature, while all parts of the masonry are obtaining the necessary solidity, and because the stream should not be interrupted in summer when water is most wanted." The acts or decrees collected at the end of the *Commentaries* are interesting, and the reader is referred to them and to POLENT.

The aqueducts of Rome seem to have engrossed all the attention of travellers, and little consideration has been paid to other ancient works of similar character in Italy. Canusium owed its aqueduct to the munificence of Atticus Herodes; there are ruins of an imperial aqueduct between Laurentum and Decimo; and between Ostia and Malafede; Trajan built one to his dock-yard opposite Isola Sagra, and another, a remarkable work by which water is conveyed from the Mignone, a distance of twenty-three miles, to Civita Vecchia. Augusta Bagenniorum, now represented by Bene and Roveglia in Piedmont, lost its aqueduct in the invasion by Alaric; the ruins are still visible; and four arches of a massy but elegant aqueduct, are the most conspicuous of the few remains which have escaped the destruction of its sister city, Aqua Stratelliorum (Acqui), to attest its ancient magnificence. Marzana, in the vicinity of Verona, also boasts of the ruins of a Roman aqueduct. This last structure closes the list of important works of this class in Italy, properly called Roman. The aqueduct called della Torre, of Spoleto, is never attributed to an earlier age than that of Theodoric, who died A.D. 526. It crosses the deep valley separating the almost insulated hill on which the city is built, from the opposite mountain, and serves both as an aqueduct and as a bridge over the torrent Morazia, supported by a range of ten great pointed arches, each 66 feet 11 inches span, on piers of 10 feet wide by 40 feet thick. CALINDRI, the celebrated engineer of Perugia, states, in his *Saggio Statistico-Storico*, that it was built by Theodelapius III, Duke of Spoleto, in 604. The same authority gives the height as 263 feet, and the length as 676 feet; scarcely any other account agrees with these dimensions, which have been stated at 308 and 420 feet for the height, with 761 and 800 feet for the length. The height given includes the thirty smaller pointed arches (rising nearly 80 feet according to the highest statement) upon which the channel is placed. The

whole structure, even taking the smallest dimensions, is an example of boldness in design (Plate III, Fig. 13) and of perfection in execution, calculated to give a very high idea of the skill of the builder; and the style of this aqueduct, as well as of the example from Constantinople, has helped to embarrass all those who have written upon the origin of Gothic architecture. It bears however sufficient evidence of repairs and additions made long subsequent to the Lombard times, whence, its substructions and the body of its nine piers are perhaps all that can safely be regarded as belonging to the original structure.

Of the modern aqueducts in Italy, the most famous is that at Caserta, about fifteen miles from Naples, built by the architect Vanvitelli, under the orders of Charles III, King of Naples, about 1750, where, in finishing the environs of the palace, vast waterworks were necessary to comply with the reigning fashion. The gardens are situated twenty-seven miles from the springs: the principal of these is the Sorgente dello Sfizzo, to which are joined several others from Airola, and these, united in one conduit, cross the river Faenza by a bridge of three arches. To cross a torrent between S. Agata dei Goti and Durazzano, a similar bridge was required; but afterward, to cross the deep valley between Montelongano and the Tifata hills, larger constructions were requisite. They consist of three stages of superimposed arcades; the lower is formed by nineteen, the next tier has twenty-seven, and the uppermost forty-three, arches, which are the loftiest; the total length is 1,618 feet, and 176 feet in height. At the ground the arches are twenty feet in span, and the alternate piers, which are as much in depth, have buttresses projecting six feet. (Plate II, Figs. 5, 6.) The piers in the second range are twelve feet in depth, and in the third story nine; the buttresses retain their original amount of projection before the face of the piers, through a battering from the level of the impost of the arches in the lowest tier. The passage worked in the piers over each story is four feet wide. The open canal in which the water runs is five feet wide by about three feet six inches high; and the body of water averages a height of about two feet six inches. The entire length of the aqueduct from its head being 126,798 feet; the fall 26 feet 5 inches is only equal to $\frac{1}{500}$ or $2\frac{1}{2}$ inches in 1000 feet.

One reason for the adoption of so little fall might be the acquaintance of the architect with the minimum above mentioned as allowed by PLINY; as the channel is open, and as rivers rarely have more than $\frac{1}{500}$ of fall, Vanvitelli probably supposed that the slope selected would be sufficient, because the quantity of water required at Caserta was not very great; and with a more rapid fall, he would have been obliged to have resorted to regulating machinery at the head, to prevent an overflow of the distributing reservoir; in that case the water would never have been so fresh and so sweet as if it were always in motion along the channel, which would have been heated by the sun while it was empty.

The subterranean works necessary to the construction of this aqueduct, were even more considerable than those above ground; it was necessary to pierce through the hills five times,—the first at Grato, in the tufo for 6,600 feet; the second at Crisco, in the solid rock for 5,700 feet; the third in the Montagna della Croce, for 2,100 feet; the fourth at Gezzano, in the solid rock for 3,540 feet; and the last at the hills near Caserta, for 1,380 feet. To give light and air to the subterranean canal, wells have been sunk, some of which are 250 feet deep, with diameters of 10 feet at the bottom and 4 feet at top.

"In the Piazza Maggiore of Olevano (near Palestrina), is a fountain, with a mutilated inscription recording the formation of an aqueduct by Pope Pius VI (1774-99), and its restoration in 1820 by Benedetto Greco 'for the love of his country'.

"The road from Civita Castellana, shortly before entering the walls of Nepi, passes a magnificent aqueduct of two tiers of arches, built by Pope Paul III (1534-50)."—MURRAY.

The aqueduct of Civita Castellana (Plate II, Fig. 7), in the

part giving to it its reputation, is built upon an ancient bridge which was a portion of an old road. The causeway itself is about 768 or 820 feet long by 30 or 32 feet wide; the greatest height being 120 or 130 feet, which is carried by nine arches, three of which are 78 or 86 feet, and the others 60 or 64 feet each in span. The piers are strengthened by buttresses, and upon this bridge is constructed the arcade for the aqueduct, about 57 or 65 feet in height, of arches 19 or 20 feet span. The precise date of this addition is not known, but it is presumed to be of the middle ages. The dimensions vary according to different authorities.

Leghorn is supplied with water brought from Colognole, and the aqueduct, erected in 1792, which, in one portion where it crosses the valley is upon the Roman model, is a fine work, in which a certain degree of dignity is joined to utility.

Leaving Loreto, on the road to Recanati, the traveller passes, at a short distance from the town, a fine aqueduct, stretching across the valley from hill to hill, and communicating with the subterranean channels by which Loreto is supplied with water: the work was commenced and completed by Pope Paul V (1605-1621), at an expense of £40,000.

The water of the Arno is not considered wholesome, and that of the wells and springs near the city of Pisa is hardly drinkable. This inconvenience, however, has been entirely removed by the care and munificence of Ferdinand I and Cosmo II in making (1606-13), at a cost of £35,000, a water-course from the Monte Pisano, where two springs are led into one generally subterranean vaulted channel, which on account of the level passes in some places at about three feet above ground. There are eight deposit-reservoirs in the course of this aqueduct, the most remarkable of which is one of marble at the village of S. Rocco: thence, 958 arches, each about 16 feet span, conduct the supply to Pisa, where it enters on the south-west side of the city at a height of forty feet, after a course of about four and a half miles. The arcade has acquired a most deceptive colouring of antiquity, and it is curious to contrast the science and skill of this aqueduct, called of Asciano, completely an imperial Roman work both in design and execution, with the simplicity of its contemporary, the New River at London.

For the city of Lucca, Notolini erected an aqueduct in 1833-1835. Commencing in the hills of Vorno, near Torrigo, the sources of the brooks are conducted by sixteen bronze pipes into a subterranean channel, which joins an aqueduct on arcades, numbering 459 arches, up to the place where the water falls into a marble basin, surrounded, or rather formed by a sort of monopteral temple, whose cupola is sustained by twelve monolithic Doric columns. The length of the arcades is 11,624 3 inches, the span of each arch is 17 feet. The width of the piers is 7 feet 8 inches, and their depth 12 feet 6 inches. The water channel 2 feet 2½ inches wide, and as much in height, is divided into two streams, so as to assure a constant supply in case of any accident to either of them, and to convey separately the best water for drinking. The greatest height above ground of the arcades is 59 feet, and the least is 25 feet 6 inches; and near the city, facing the gate S. Pietro, about 37 feet. All the arches are constructed in brick, upon stone piers. From the basin placed in the monopteron the water falls perpendicularly into cast iron pipes, to be conveyed to the city by similar horizontal tubes laid in the ground. This sumptuous and useful monument, which cost £45,207, is equally glorious to the Duke Charles Louis and to his engineer.

In A.D. 1276, the engineer Bocca Négro commenced the construction of an aqueduct destined to carry soft water to Genoa. It was commenced in the valley of the Vento, but the works having been interrupted, it remained unfinished until 1636, when Giovanni Aicardi completed it. The water, from the sources of the torrent Bisogno, is at first led into a subterranean channel, but nearer the town in crossing the valleys it is supported by arcades. The syphon-bridge, which traverses

the valley of Cavarola, is the most considerable of this work, although only 215 feet long; but its highest arches give an elevation of 100 feet. (Plate III, Fig. 1, and Fig. 12.) The subterranean portion is made of cast iron syphons; on arrival at the city, the water is conveyed by leaden pipes through the streets into the houses. The pipes are enveloped in hollowed marble conduits. The length of the aqueduct is 5 miles. The Genoese have however wisely availed themselves of the progress of time, and have made such alterations as to render this aqueduct almost entirely modern. The celebrated syphon bridge called the Ponte dell' Arcate, is a portion which crosses the valley of the torrent Geivato, and carries the channel from the hill of Molassina to that of Pino. The horizontal distance between the two extremities of the syphon is about 2,193 feet 6 inches, and its lowest part is placed at a difference of level from the upper reservoirs of 164 feet; the difference between the two reservoirs being 24 feet 6 inches. The diameter of the pipes is nearly $14\frac{1}{2}$ inches, with a thickness of three quarters of an inch. The total length of this aqueduct is nearly fifteen miles from the source at Schiena d'Asina to the city, and its construction dates about the year 1782.



The aqueduct is often the only testimony to the military occupation by the Romans of the territory on their frontiers: the traveller will find such ruins at Apulum (Weissenberg), and Drusus is claimed as the builder of the conduit which once supplied Ulpia Trajana (Koloswar). Diocletian is named as the builder of the aqueduct from Salona to Spalatum, five miles in length, built of squared stone in regular courses, with a single range of arches. The finest remains in Germany of subjects of this class are at Treves, where the piers of an arcade are still standing, and are accompanied by portions of the channel: and similar vestiges are to be found at Augusta Rauracorum (Basle Augst), and the Colonia Agrippina (Cologne).

Commencing the list of ancient aqueducts in France, the most northerly will be found to be that of Metz, supposed to have been built by order of Drusus, in the reign of Tiberius. The principal source of this aqueduct was above Gorze, and thence the channel, following the hills in a serpentine line with great detours, passed not far from the village of Jouy aux Arches, six miles on the road from Nancy to Metz. Its total length from the mill of Gorze to its destination, although only about nine miles and a half in a straight line, was nearly fourteen miles, with a fall of nearly 73 feet, or about $\frac{1}{1000}$. This is not uniform, as the slope varies according to the character of the country. The portion in arcades which passed the Moselle near Jouy, in a single tier of 118 arches, each about 17 feet 10 inches span, on piers 14 feet deep by 4 feet 5 inches wide (Plate III, Fig. 7), must have been about 3583 feet long. As only seventeen arches remain on the side next Jouy, and five on the opposite bank of the Moselle, it is difficult to say what was the height of the arches above the river: the road passes under one about 60 feet high, built of stone-like bricks 3 and 4 inches high; the imposts are of white marble. At both extremities of the bridge were reservoirs for delivery; the receiving cistern is circular, probably because the aqueduct here makes a right angle. The remarkable features in these two reservoirs are the centre basins, intended, without doubt, to prevent the sediment therein from entering the aqueduct, and for this purpose a step, level with the bed of the channel, formed the basin twelve inches deep. The channel divides upon the bridge into two branches, for which, amongst several reasons assigned, the best appears to be the desire to check in some

degree the velocity of the current, so as to allow the sediment to be more quickly deposited in the basins.

In the neighbourhood of Lyons traces have been found of three Roman aqueducts (DELOIRME, *Recherches sur les Aqueducs de Lyons*, 12mo, Lyons, 1760); the first, which was constructed by the troops of Mark Antony, drew its water from the Mont d'Or, by means of two branches which embraced that group of hills; but the water thus furnished not being sufficient, a second was built to take water from the Loire, near Fours; and the third, presently to be described, was made by Claudius, who was born at Lyons, to supply the highest portion of the hill on which the palace of the emperors was situated: all these aqueducts, built in the same age, are of similar construction. Afterwards a fourth was made along the Rhone, whose water was taken near Montluel and Miribel; this last seems to have been intended for the supply of the lower town, and it is doubtful if it were a Roman work.

The aqueduct of Mont Pila (Pl. III, Figs. 6 & 9), commonly known as the aqueduct of Lyons, obtained its supply at the foot of Mont Pila and from several branches which meet it in its course: it is more than thirty-nine miles in length, on account of its circuit, the direct distance being only thirty; and if to the larger amount be added the different feeders, the total will be about forty-five miles. The aqueduct is carried in the valleys by fourteen bridges, excepting in three cases by souterazies, one between S. Foy and the suburb called Fourvieres, where the valley is 1,700 feet wide; another from S. Foy to Boan, or Baunan, where the dip is 3,458 feet wide and 325 feet deep; and the third, from Chaponest to Soucieux, where the valley is 2,600 feet across by 217 feet deep; five tiers of arches would hardly have sufficed to carry the canal or channel across it. In the course of this article the same mode will be mentioned, but only describing those aqueducts of more recent construction. The difference of level between the source and outlet of this aqueduct is 360 feet, which, for thirty-nine miles, gives a fall of 1 in 572, or about 1 foot 9 inches in 1000 feet.

For the canals or channels of the aqueducts, either below ground or piercing the hills, the Romans (according to DELOIRME's inference drawn from this aqueduct), made a trench five feet wide by ten feet deep, following one uniform slope of 1 in 600, and in this trench they built the aqueduct, placing at the bottom a mass of masonry, one foot in thickness, on which were raised two walls, each eighteen inches thick, five feet high, and two feet apart, forming the channel, and surmounted by a semicircular vault one foot thick, ordinarily covered by two feet of earth; the inside of the channel being coated with six inches of cement on the bottom and on the sides. The junction of the sides with the bottom was rounded in the angle. The walls were constructed with small stone rubble, from three to six inches thick, bedded in mortar in such a manner as to leave no space between the stones. The use of larger stone than six-inch rubble was avoided, because walls of small stones, well grouted, were found to form a mass more solid than one built with large blocks: bricks do not appear to have entered into these constructions. The Romans preferred coarse gravelly sand for this sort of masonry to fine sand, which is scarcely proper but for plastering; and when obliged to use it, they took care to mix it with pulverised brick, as in the aqueduct of Nismes; the same course was adopted with the coarser sand, and lime from the best stone was frequently used.

The cement employed for the plastering of aqueducts was composed of portions of brick, the size of peas, for the first coat, and much smaller for the last. In plastering the bottom the pieces of brick were as large as nuts and eggs; the mixture was made with fresh lime, without any other ingredient. The walls of the channels out of the ground are from 22 to 24 inches thick; the external faces are of reticulated masonry, each lozenge of which is $3\frac{1}{4}$ inches square, without any courses

of bricks. The covering of the vault of the aqueduct in the open air was slightly rounded to let the rain-water run off, yet sufficiently flat to allow of walking upon it to the reservoirs and into the aqueduct, which were entered by iron trap-doors, two feet square, worked into their vaults. The subterranean portions had similar entrances upon square wells, raised two or three feet above the ground; two such still remain between Mornant and S. Laurent d'Agny. To regulate the entrance of the water into the aqueduct, a flap (*vanne*, floodgate), or paddle (*porte à coulisse*, sluice-gate), was placed at each supply, to let no more enter than the quantity desired: this was about 22½ inches.

The aqueduct on the ground—here that of Mont Pila only is spoken of—was supported upon solid masonry, six feet in thickness, while the highest above ground did not exceed six or seven feet; but when it was higher, arches were constructed, and piers for the arches, as the elevation increased. Upon this depended the width of the arcades, the size of the piers, and their height: for example, if the headway of the arch gave 18 feet, its diameter was 12 feet, the pier 12 feet by 6 on its face, and the foundation 3 or 4 feet deep, according to the nature of the ground, with three sets-off of six inches each. As the upper portion in which the canal or channel is placed is only six feet thick, a chamfered set-off of ten inches has been worked on each face, which reduces the pier and arch to the thickness required. All these portions of the aqueduct were of similar construction, in small rubble work, laid in courses, and bedded in mortar, and the external faces in reticulated masonry, which was bonded at every four feet in height by two courses of large bricks or tiles, twenty-two inches square and two inches thick. The small ashling at the angles, which had not sufficient bond with the lozenge work, has contributed to the decay of the erection, as it has been seized for private buildings. Such piers could only be constructed by caissons four feet high, tightened by two rows of keys or bands, like moulds. The arches, semicircular, are formed by voussoirs of ashling, about three inches thick, with a row of large bricks as a hood, upon the key of which runs a double course of bricks throughout the length of the aqueduct, without forming any projection: on these bricks the drain of the channel is based. The masonry does not appear to have been well executed, for there are many indications of repairs, and the piers of the bridge on the valley of Chaponest, which were originally made with transverse discharging arches, needed to be filled in solidly before the bridge was finished.

The Baunan souterazici only differs from that of Chaponest, about to be described, in having reservoirs 19 feet 6 inches long by 6 feet 6 inches wide, with openings for twelve pipes, because it was laid in the deepest of the three valleys; the perpendicular height of the descending limb being 282 feet. The third souterazici was much less important, and does not require special notice. The reservoir on the Soucien hill was placed on strong piers, and was internally 14 feet long by 4 feet 6 inches wide, and 4 feet 9 inches high to the springing of the semicircular vault, with walls 2 feet 3 inches thick of rubble, faced with dressed and coursed stone, and two ranges of wrought iron ties to resist the pressure of the water. The vault is pierced in the middle by an opening, two feet square, which may be judged to be for a free supply of air (though DELORME supposes it was intended for an entrance), because had it been simply a door, it would have been closed with an iron gate, as in the length of the aqueduct. At nine inches above the bottom of the reservoir, its wall, next the valley, was pierced by nine oval openings, 12 inches high by 10 inches wide, and 7 inches apart: through these apertures the water left the delivery reservoir by as many leaden pipes, 8½ inches diameter and 1½ inches thick, which, descending into the valley, were laid at first upon ramping arches, and afterwards upon solid masonry, the fall being regulated to the top of the arcade, upon which they crossed the bottom of the valley. (Plate 111, Fig. 6.) The pipes con-

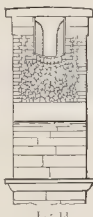
tinued of the same diameter for one-half the descent, or about 81 feet; they then divided each into two smaller pipes of 6 inches diameter each, which completed the descending limb of the tube, continued over the bridge in the bottom of the valley, and then remounted to an equal height, where they again became nine pipes as before, and so connected the two reservoirs. The pipes in the level part were laid upon carefully constructed walls, with large stones at the elbows, and were covered with earth, well rammed down, to resist the cold, and in some degree the pressure; they were also tied down to the sleeper walls. A set of vent pipes was brought from the lowest part of the descending tubes above the level of the upper reservoir to secure the discharge of air. The perpendicular height of the upper limb of the tube was 164 feet; that of the lower limb was 142 feet 2 inches, and the whole width of the valley 2,600 feet. The reservoirs, which took the water from the pipes on the opposite side differed from those whence the water came, inasmuch as the openings to receive the pipes were placed about three feet above the drain, so that the reservoir, and consequently the aqueduct, could hold two feet in depth of water, while in the delivery reservoir it might be three or four feet deep, on account of the resistance of the air to its entry into the tubes, or rather on account of the pressure of the atmosphere in the receiving cistern.

In the valley near Saintes (Mediolanum Santonum), exist some slight remains of an aqueduct; and CAYLUS (*Recueil d'Antiquités*, etc., 4to., Paris, 1752-67) described other ruins near Luynes, in Touraine, about 900 feet long, in sixty-two arches then in tolerable preservation, each arch being 10 feet 5 inches span, on piers 4 feet wide at the ground, but 3 feet at the springing, the tallest pier being about 28 feet high; all the work was executed in small rubble, and the specus or forma no longer existed. There are also remains of an arcade over the valley of Gargallon, close to the road leading from Forum Julii (Fréjus) to Antibes, which must have been of considerable length. The arches, which are entire, are about 56 feet high, and they are strutted, by means of buttresses, against the extremely violent gusts of wind, which occasionally sweep along the valley (CRESY).

The aqueduct of Nismes is probably the most ancient of the remains of such erections executed by the Romans beyond the Campagna. The boldness of its erection, and the beauty of its proportions, combined with the picturesque nature of its position, render this one of the most impressive series of arcades, which will come within the scope of this notice. The formation of the fabric may be attributed, according to the authorities who give the highest antiquity, to M. Vips. Agrippa. This aqueduct, whose development is about twenty-one miles from the gates of Nismes, forms, in its course of 135,305 feet, a horse-shoe shape; for it obtained the water from the sources of the Eure and Aivan, situated to the eastward of, and below, the town of Uzès; while the Pont du Gard is the middle, and the fountain at Nismes the termination of the aqueduct. The Pont du Gard, at that portion which covers the deep valley of the river Gardon or Gard, amongst the hills between Vers and S. Bonnet, is composed of three tiers of semicircular arcades, springing from imposts upon the piers (Pl. II, Figs. 13, 17, 18). The lowest story has six arches; the next range has eleven, and they are both of the same height of 66 feet, and the arches in both stories are 63 feet 10 inches span, except over the river, where they are 80 feet span, springing from a lower level than that of the imposts of the side arches. The length at the level of the first story is 561 feet 9 inches; at that of the second, 882 feet 11½ inches, which last figures give very nearly the dimensions of the top of the aqueduct between the two extremities, which have been broken away or destroyed. The uppermost tier, 28 feet high, consists of thirty-five arches, each about 16 feet 9 inches span; but no correspondence with the lower ranges is preserved. As the two hills forming the valley are not of equal elevation (that on the left bank being much lower than the level of the aqueduct, while the opposite

one is much higher), the channel was sustained on one side by a long range of arches, similar to those of the higher story, and on the other it was, of course, engaged in the side of the hills; the top of the conduit being about 157 feet 6 inches above low water in the river. The width of the piers in the first tier is 21 feet 6 inches; of the second, 15 feet; and of the third, 12 feet; this projection on each side, added to that of the cornice, forms foot paths 4 feet 3 inches wide, and two feet wide, by which the valley was crossed at either level. This Pont du Gard is entirely constructed of squared freestone, with its face coarsely pointed by the masons, from the foundations up to the third course above the cymatium, which crowns the piers of the highest tier, no rubble work having been used in filling up the haunches and piers of the two lower ranges. The spandrel filling and the upper portion of the third story were the only parts of the masonry which were worked to a smooth face; all the masonry was laid dry without any cement, and owes its stability to the mass of each block and the precision of the beds and joints. The corbels, on which the scaffolding and centres were erected were never cut away; this sensible precaution has been met with in several other ancient examples.

The conduit, or rather channel, is the only part which was not in cut stone; it is constructed in ordinary masonry on the two faces of the bridge and aqueduct, and in rough rubble for the interior; this rubble-work, in which cement was not spared, formed a mass absolutely impermeable to infiltration. The inside face of the walls and the bottom, which was worked hollow to a segment of a circle for its transverse section, Fig. 13, were covered with a coat of cement, about 1½ inches thick, made of lime, fine sand, and almost pulverized brick, and still possessing a tenacity and consistency equal to the hardest stones; no wearing away, no alteration, being as yet found in it. This first layer of cement was covered with another coat of very fine mortar, at most ½ of an inch thick, and of a deep dark red colour, leaving a waterway 4 feet 2 inches wide.



The courses are in general two feet in height: the key-stone of the large arch is 5 feet 3 inches, and that of the others 5 feet, deep: those of the arches of the upper story are 2 feet 7 inches in depth. The lower arches are formed of four separate rings, those of the range above of three, and those of the upper range, of single rings or courses of voussoirs. Each soffit exhibits three distinct arches not tied or bonded together.

The aqueduct is constructed with the same care throughout its length, the only difference being, that in the exposed parts, it was finished with slabs of stone, 14 inches thick; while in the subterranean portion it was covered by a semicircular vault, of rough rubble work, about 1 foot 11½ inches thick, which gave to this part an additional height of 2 feet 2 inches inside, because the vault always sprang from 5 feet 3 inches above the bed of the channel. A considerable petrification or concretion was found formed on the exposed side of the innermost antique coating of cement, and it had gained a thickness of more than 10½ inches at the height of 3 feet 3½ inches from the bottom; from its immediate diminution, it results that the height of the water was regulated by the abundance in its feeders, and that its most usual height in the canal was 3 feet 3½ inches; it rarely rose to 4 feet 7 inches, because here very slight traces of sediment are found. The fall of the channel was about 1 in 2,500.

It is supposed that the aqueduct was broken up by the barbarians about A.D. 406; and upon this conjecture the water would have been running for about four centuries. At the commencement of the eighteenth century, according to RONDELET and others, but in reality of the seventeenth, the Duke de Rohan, to facilitate the passage of his artillery, caused all the piers of the arches in the middle row, on the upper side, to be cut away for one third of their thickness, about 10 feet high; setting

aside the barbarism of the deed, it must be confessed that it was done with some conscience, because the equilibrium and construction of the masonry were preserved; as it was considered that this mutilation was ruinous to the bridge, repairs were made in 1700, under the architect Daviler. In 1745 a carriage way was built against the Roman work, at the level of the floor of the middle story, and other repairs of the structure were executed to ensure its stability under Pitot (Pl. 2, Fig. 18).

In considering Paris and its environs or rather dependencies, it appears that the first existing modern French aqueduct was executed under Philip Augustus, between 1180 and 1223, to convey a supply of water from S. Gervais and Belleville. Henry IV, besides adding watermills to the Seine, in 1606 proposed bringing water by an aqueduct from Arcueil, which owes its origin to the Emperor Julian, who, after building a palace on the ground afterwards occupied by the Sorbonne and the Hôtel de Cluny, about the year 360, constructed an aqueduct, which was more than 48,000 feet long, to supply this palace, and the thermæ appended to it, with water from the villages of Louans, Montjean, Chilli, Vuissons, and other places in their vicinity. This aqueduct was destroyed by the Normans, and it had so remained for more than eight centuries. After the death of Henry IV, the new aqueduct was steadily continued and the water from Arcueil is said to have reached Paris in 1634, under the direction of the architect Jacques de Brosse, and from that time till the year 1780, numberless plans were submitted and put into execution by Louis XIII and XIV to increase the supply. Although the aqueduct has been partly reconstructed, yet improvements remain to be made, especially at the sources. Fragments of the ancient construction still exist, contiguous to the modern work, which is about 45,937 feet 6 inches long. At present the water called d'Arcueil (because it is brought by an aqueduct constructed at the extremity of the village of that name), comes from a place called the Grand Carré of Rungis. This great reservoir, receives all the springs which are brought thither by the different water-courses. It is a square plot of ground about seven and a-half acres in extent, encompassed by a vaulted gallery. In this gallery is a channel, which receives all the water, and conducts it into a reservoir, situated at one of the angles of the before-mentioned site, and then into a vaulted subterranean channel. Many loopholes (*barbacanes*) have been worked in the walls of this channel at intervals between the first reservoir (that of Rungis) and the aqueduct-bridge of Arcueil. These openings receive the land water, and also the contents of many water-courses, which have been made since the construction of the aqueduct; the part of it from Rungis to the bridge is 22,020 feet long, with a fall of 42 feet ½ inch. The bridge is 1,250 feet long and 11 feet 9 inches broad, strengthened at every 40 feet by buttresses, between which are nine arches, each 25 feet 7 inches span; the greatest height is 72 feet, of admirable construction in squared stone. At the head of the aqueduct-bridge is a reservoir in which is a *carré*, receiving all the water; it is here gauged, thus giving a means of knowing the increase or loss which may have occurred between Rungis and Arcueil. The water, leaving this *carré*, crosses the valley of Arcueil on the aqueduct-bridge, and afterwards runs below ground to a waterhouse near the Observatory. This part of the aqueduct (Plate II, Fig. 20) is 25,980 feet long, with a fall of 11 feet 6½ inches. In the length last mentioned there are twenty-seven reservoirs, having staircases to allow of workmen descending. On arriving at the observatory the water is divided, one part going to the Luxembourg, Rue d'Enfer, the other portion to the half-moon of the Chartreux. At these places it is subdivided to the public fountains and to private concessions.

Two sections are given (Plate II). Fig. 19 shows the old construction, with the channel and a *banquette* or raised way on each side of it, on which to step along; but as these were found to be very inconvenient, a *banquette*, on one side only and much larger, was formed in the new construction as shown in Fig. 21.

At Maintenon, the valley of the river Eure is crossed by the imposing ruins of the aqueduct commenced in 1680 by Vauban and Lahire at the mandate of Louis XIV, to convey water from the Eure at Pont Gouin to Versailles. The war of 1688 interrupted the labour, and it was never resumed. The source was seventy-one miles from the Cour de Marbre at the Palace, with a fall of 1 in 2,933. It was intended that the Maintenon aqueduct-bridge should be nearly three miles and a quarter long, in three tiers of arcades (Pl. III, Fig. 12, and Pl. II, Fig. 9), 234 feet high; altogether containing 685 arches; but it was partly pulled down to build the villa of Crécy for M^{de}. de Pompadour, and the present remains consist of forty-seven arches, each 83 feet high and 42 feet in span. This project, far from ever being revived, has been altogether cast into oblivion, and, though unfinished, cost no less than £880,000. The minutest details are given with drawings by RONDELET. Another system for the supply of Versailles and its waterworks was subsequently adopted; which consisted in using about 70 miles of catch-water drains over 37,500 acres, running into 25 reservoirs; a conduit 21 miles long, partly subterranean; and an arched bridge at Buc (Pl. II, Fig. 22), about 1,965 feet long and 133 feet high, where it crosses the Bièvre. It consists of two rows of arches: the upper are nineteen in number; the lower range carries a bridge 13 feet 2 inches wide, over which the road crosses the valley, and is continued on a terrace of earth, so that the lower arches are completely buried. The length is 1,345 feet, and the height 42 feet 8 inches. The thickness of the piers is 13 feet 10 inches. There are no buttresses, but their place is supplied by giving considerable slope to the sides. The masonry of the piers is in a kind of mill-stone, strengthened by quoins of squared stone. This, and the operations for the same purpose at Rannequin, which necessitated the erection in 1682 of the aqueduct of Marly, are presumed to be still used. This last aqueduct is 2,113 feet long; consisting of a row of arches 25 feet 6 inches span, with piers of the same width, but 19 feet 2 inches thick below, and 6 feet 6 inches above. The greatest height is 82 feet.

Under the Roman dominion, Arles was plentifully supplied with spring water conveyed to it from the Alpine chain, in aqueducts of masonry many miles long (Pl. II, Fig. 4); the modern town is now destitute of this important commodity.

The aqueduct of Carpentras is 2,560 feet long, and is composed of thirty-three semi-circular arches, 38 feet 4 inches span, and 12 lesser arches of 25 feet 7 inches span, all in one range; below the level of which is the segmental arch, 76 feet 9 inches span, on which it crosses the Auzon. The width below is 17 feet, and 7 feet 3 inches above: the greatest height is 82 feet (Pl. III, Fig. 5).

One of the most magnificent aqueducts existing in France is that of Montpellier, begun in 1742 and completed by the architect Pitot in 1752. The source is at the spring of S. Clement; the channel runs about 42,000 feet to the Place de Peyrou, where it terminates in a very handsome castellum; this forms the termination of a construction 3,215 feet long, of which about 2,300 feet is in an arcade 92 feet high, of two tiers, the bottom being in 70 arches, each arch 27 feet 8 inches span, with piers 12 feet 3 inches wide (Plate III, Fig. 11). The arcade of the upper tier is so arranged as to show three arches between the centres of the lower piers, each arch being 9 feet in span, with piers 4 feet wide. The aqueduct is constructed entirely of squared stone, and the castellum, in the form of a circular temple, over the distributing reservoir, is highly praised. The conduit is about 12½ feet wide and 10½ deep internally (Fig. 14), the fall being uniformly $\frac{200}{1,000}$ or nearly 1 in 35.

The town of Marseilles has however carried into execution, under M. de Montricher, a still more wonderful work, one not

exceeded in importance by any such undertaking of modern times. The source of supply is from the Durance, near Pertuis, a distance of nearly ninety-eight miles, of which about twelve miles and three-quarters are tunnelled; and the remainder of the distance required 237 aqueducts, and 537 culverts. The great work, however, is the arcade in three tiers, executed in 1846, of squared stone, with a rusticated or rough scabbled face, over the valley of Roquefaveur, where the width is at least 1312 feet; the greatest height of the arches is 282 feet; the mean height 272 feet, without reckoning the foundations, which reached an additional average depth of 31 feet 6 inches (Pl. III, Fig. 2). The lower tier is about 111 feet 10 inches high, taking an average to the top of the string-course, and the middle range is 124 feet 8 inches. The piers of those two lower ranges are 69 feet 9 inches apart from centre to centre, and the span of the arches is about 50 feet. The illustration will show that there is a difference in these openings, the lower piers being wider than the upper ones. There is about 8 feet 3 inches between the bottom of the keystones and the floor of the tier above, of which 4 feet 3 inches may be given to the string-course. The haunches of the arches are eased by means of a semicircular arch, upon the top of which a passage is constructed through the piers by means of arched openings, each 3 feet 4 inches wide by 6 feet 7½ inches high at the different stages. The third story is 35 feet 6 inches high to the top of the aqueduct, and is so divided as to show three arches between the centres of the lower piers.

About three miles on the road from Tarragona to Lérida, there exists on the right hand a Roman aqueduct, in which a range of two arcades rises to a height of 96 feet (Pl. II, Fig. 11). There are eleven arches in the lower story, 20 feet span, on piers 11 feet 8 inches wide by 12 feet deep; and twenty-seven arches in the upper range, 21 feet span, on piers 10 feet 8 inches wide by 9 feet deep, forming a bridge 700 feet long: it is remarkable for the slope given to the upper piers. The water runs, partly underground, nearly twenty miles from the Pont d'Armentara; and the aqueduct is called *le milagros*, a general name for such wonderful structures, the *punte de Ferreras*, and by the vulgar *del Diablo*. It was ruined by the Moors, and so remained upwards of a thousand years, until repaired by the Archbishop Joaquin de Santiyan de Valdivielso, who died in 1783, leaving funds to complete the work, which was done by Señor Armañac. It was again destroyed by Marshal Suchet, who broke it down near the Olivo; but these injuries have likewise been repaired, and it still supplies the town.

As the steep banked rivers below Segovia are difficult of access, and their water not very wholesome, the pure stream of the Rio Frio was brought by the Romans, on an aqueduct attributed to Trajan, from the Sierra Fonfria, commencing about nine miles from the city, near a house on the road to S. Ildefonso. Beginning thus, near S. Gabriel, it runs 216 feet to the first angle, then 462 feet to the second at la Concepcion, then 925 feet to the third at S. Francisco, and then 937 feet to the city wall. Passing along one side of the Plaza del Azoquejo, and as far as the small square opposite the church of S. Sebastian, the water is thence distributed by subterranean channels to the houses. The aqueduct-bridge, consisting of 109 arches, was respected by the Goths, but broken down in 1071 by the Moors of Toledo, who sacked Segovia and destroyed thirty-five arches. It remained in ruins until August 26, 1483, when Isabella II employed a monk of the Parral convent, named Juan Escovedo, to restore it, who had the good taste to imitate the model before him. The new work is intermixed with the old, and occurs chiefly near the angle of la Concepcion and S. Francisco. The total length is about 2,530 feet, the greatest height of the bridge is 104 feet, and when necessary two ranges of arcades were employed; the arches in the upper range were 11 feet 8 inches span, on piers 4 feet 6 inches wide by 6 feet deep; the arches in the lower range were 13 feet 8 inches span, on piers 11 feet 6 inches deep. The illustration (Plate I, Fig.



Fig. 14.

13) obligingly furnished by Mr. Waring, will give some idea of the magnificence of this aqueduct, which is of squared stone laid without cement, and altogether fifteen miles in length; still supplying water, at the height of the city itself.

Toledo, built on a lofty rock, was badly supplied with water; whereupon the Romans spanned the defile with a gigantic viaduct and aqueduct, which ran from the Puerto de Yébenes about twenty-one miles. Its greatest height is 102 feet, at Los Siete Cantos, and the lower arches are 11 feet 8 inches span, the upper arches being 15 feet 8 inches span; it is built of granite, laid without cement or mortar; and, like other similar Roman works, unites simplicity, proportion, solidity, and utility, in one general effect of grandeur.

The great aqueduct of Merida, however, is considered to be one of the grandest remains of classic antiquity. Ten arches are nearly perfect, and thirty-seven piers remain in place. Some of these piers are 90 feet high, and arched in three tiers (Pl. III, Fig. 8), with a level platform running between each, and made of granite worked *en bossage*, and of brick, which is principally used for the stringcourses. This was only one of the many Roman aqueducts which poured rivers into Merida; another, crossing the Madrid road, although it has only three arches left standing, puts to shame a modern attempt at an aqueduct built by the Maestro Esquivel, under Philip II; which conveys water from El Borbollón, a spring which rises about six miles from Merida, near the village Truxillanos.

The aqueduct of Evora, forty miles long, is a Roman work of grey limestone, and of brick; there is a peculiarity about this work deserving particular attention, viz., that the arches are divided into bays, with stouter piers forming buttresses in both the longitudinal and transverse directions of the bridge; this consists of twenty-five arches, each 13 feet 6 inches span, on piers 4 feet 6 inches wide by 9 feet thick, of which it has been noticed that the width was one-third of the span, and the united length of the four sides of the pier was equal to twice the span. The arches were 50 feet high under the key-stone. The castellum, which contained the distributing reservoir, was a beautiful circular edifice 12 feet 6 inches in diameter outside the walls, and around it were eight Ionic three-quarter columns with their entablature, supporting a second story, with flat pilasters, and surmounted by a hemispherical dome, all executed in brickwork covered with cement. The spaces between the columns on the lower floor were decorated with semicircular niches, having striated heads; and the spaces between the pilasters in the upper floor were left open for ventilation. This is still nearly perfect, as is the rest of the aqueduct, which continues to supply the modern town.

At Italica (Sevilla Vedra),—the birth-place of Trajan, Hadrian, and Theodosius,—traces exist of the reservoir of the aqueduct constructed by Hadrian; the other works are not now visible. The Caños de Carmona are Roman arches repaired by the Moors, forming part of the well supplied conduit, which even runs at present, although unknown to the majority of the inhabitants of Seville.

Between Liria and Chelva, or Chelves, may be seen an aqueduct built about the year 1500; and some remains of a Moorish aqueduct exist at Chestalgar, near Chelves, whose Rambla de los Arcos takes its name from a fine Roman aqueduct partly in ruins (Pl. II, Fig. 8). These successors to the dominion of Spain also executed the small aqueducts at Castellón de la Roca, and under the Rambla de la Viuda, near Grenada: both these were chiefly undertaken for the purpose of irrigation. The extreme height of the latter is about 70 feet, on arches about 8 feet 9 inches span. The Moors perhaps introduced the system of *souterrazis* into Spain; at least that at Castellón de la Plana, which passes under the Rambla de la Viuda, is attributed to them: a similar work is in use at Puerto Real, near Cadiz, constructed in 1776; and there is another modern one at Talavera la Reyna, besides one which supplies the fountain called La Carolina, at Madrid.

The fountains at Pampeluna are well supplied from a noble aqueduct, which was built in a style of Roman solidity, by Ventura Rodríguez, about 1783, the water being brought from the hills of Subiza, nine miles distant; one portion, 2,300 feet in length, contains ninety-seven arches of 35 feet span, and 65 feet high.

The aqueduct which leads the springs from the neighbourhood of Bellas, a distance of twelve miles, to Lisbon, traverses a valley of extraordinary depth, by means of a bridge 2,600 feet long; the centre arch is 229 feet high to the under-side of the key-stone, and 98 feet 4 inches span; the shape of the arch being that of an ellipsis divided, and standing on its minor axis (Pl. III, Fig. 3). There are altogether thirty-two arches, on piers 23 feet by 16 feet 6 inches. The water flows through a channel about 8 feet wide, divided by an upright wall; and on each side are parapets and footways for the purposes of examination and repairs. This is often cited as a work of the Romans; but in fact it was erected by Manoel da Moya, employed by John V, who commenced it in the year 1713, and finished it in 1732. The material is a kind of white marble.

AMERICA.

The former inhabitants of Peru, Chili, and other parts of South America, as well as the ancient Mexicans, constructed many and extensive works (*conduits*) for the supply of their towns and cities with water, and also for the encouragement of agriculture. The channels were often of great magnitude; for besides many mentioned as being fifty miles in length, Viracocha, the seventh Inca of Peru, is stated to have made one twelve feet in depth, and three hundred and sixty miles long, through the province of Rucana; and another, somewhat similar, traverses the whole division of Cuntisuya, in a course of four hundred and fifty miles. No arches are mentioned in these constructions, for the line was made through the hills; the channel being made of hewn stone cemented together, and earth rammed down over it so tightly as to prevent any escape through accidental holes. Many of these works consisted of two conduits,—the larger was for general use, the smaller to supply the inhabitants and fields while the other was being cleansed. Such were those of Churubusco, still to be seen, according to Humboldt, and of Chapultepec. It is known that the latter, which carried two or three rows of pipes made of trees hollowed, was built by Montezuma. Iztacalapa, Zacatecas, and Palenque, had their aqueducts; and the ruins of Tezcuco still show the remains of a fine one, in a sufficient state of preservation for general use.—TOWERS, *Illustrations of the Croton Aqueduct*, 4to., New York, 1843.

The engineers of the United States consider that the Croton aqueduct (formed in order to supply the city of New York), is one of the greatest and most important works in the world, on account of the boldness of the plan, as well as for the admirable manner of its execution. It undoubtedly deserves very high commendation, and is the only great aqueduct in North America; the cities of the United States being chiefly supplied through iron mains. This aqueduct was designed by Major Douglass, under whose direction the preparations for its execution were made; but in consequence of some dissensions the completion of the work was intrusted to Mr. John B. Jarvis, previously engaged in the execution of State canals; his principal assistant was Mr. Horatio Allen.

The water of the Croton river was raised forty feet, by the construction of a dam which caused the stream to form a lake of 400 acres; this is the collecting reservoir of the aqueduct. At first it was proposed to use an open trapezium-shaped canal, but as the water might become impregnated in its course, and a considerable quantity be lost by sinking and evaporation, as well as be exposed to the wading of cattle, to bathing, and to being filled up with earth and snow washed in, and might freeze out in winter, it therefore became necessary to cover it. As a wooden roof to the canal did not appear impenetrable to frost

and heat, it was at last resolved to arch the whole, notwithstanding the great expense. The channel, when in cuttings or in embankments, was built of granite or of gneiss masonry. The following is a general description of its form; the side walls, of brick, are sloping, and 4 feet in height; it is 7 feet 5 inches wide at top, and 6 feet 9 inches wide at the bottom, where it joins a brick segmental invert, having a versed sine of 9 inches. The arch is semicircular, either of brick or stone, as considered necessary. When tunnelled in the rock, the sloping sides and invert were retained, whilst the top was formed by the solid rock; and when tunnelling in the earth was required, the side walls were made segmental, instead of sloping, to resist the lateral pressure.

The total length of the aqueduct from its head to the distribution of the water is about forty-five miles, nearly twenty-eight miles of which have a regular fall of 1-1088 feet per mile, *i. e.*, nearly $\frac{1}{320}$. The varieties of fall to suit particular circumstances are given by SCHRAMKE (*Description of the New York Aqueduct*, 8vo, New York, 1846, p. 26), and TOWERS (above mentioned), whose works may be consulted for all the detail of execution. Ventilators as *lumina* were erected at distances of every third mile, while two others, as *putei*, were placed between each pair of shafts. Twenty-two are made of white marble, the rest, eleven in number, are of gneiss. At suitable points, waste weirs are put, to draw out the water when required, these are seven in the whole line, and they serve likewise for ventilation. The receiving reservoir contains 150,000,000 gallons; it is divided into two portions, for the purpose of inspection and repairs.

To cross the Manhattan valley, an aqueduct bridge, 105 feet high, and 4,180 feet long, would have been required; this would have preserved 3 feet of head pressure for the conduit water, but at an expense of (1,200,000 dollars) £240,000, while the passage by four pipes of 36 inches each, was calculated to cost one-fifth of that amount; it was therefore adopted. For the same reason it seemed desirable to carry the conduit water over the Hackensack river in a *souterrain* with iron pipes, but it was proposed to let them pass in the centre over an arch 120 feet wide and 60 feet high. This was an object of popular disgust, and being compelled by the legislature either to carry it below the bottom of the river, or on a bridge (Pl. III, Fig. 4), the latter course was adopted, although exceeding the tube system by, in cost (200,000 dollars) £40,000. With this arrangement the water crosses the bridge in pipes, with a depression of 12 feet. The bridge is about thirty-three miles from the Croton dam, and crosses a stream whose tidewater occupies a width of 620 feet. There are fifteen arches, eight of which are 80 feet wide each, and 100 feet above flood tide, with piers 14 feet wide, placed in the water way; and upon the shores are seven arches of 50 feet span each, the piers being 7 feet wide; three of the large piers are thickened to 20 feet, to resist thrust, if any arch should fail. A thirty-six inch pipe being put down temporarily, the aqueduct was opened on 4th July 1842. The actual cost amounted to £1,715,000, including the purchase of land required, extinction of water rights and some unfinished works, being within 5 per cent. of the estimate made by the engineer Mr. Jervis; to this is added £360,000, being the cost for the distributing pipes. The money being borrowed, the total expense will be £2,500,000.

It only remains to add, that notice has not been taken of a few unimportant aqueducts, such as those of Tusculum and Volci (CREVIER) in Italy; Luynes, Vienne, Coutances, and Nérès, in France, etc.; because it seemed unnecessary on the present occasion to do more than place before the reader a general notion of each great work, in connexion with the history of the system.

It has frequently been mentioned as matter of surprise, that some of the aqueducts above described should in modern times

have been built in preference to the now ordinary method of the pipe system. On consideration of the merits of the ancient plan, it will be found that although nearly two thousand years have elapsed, some of the erections have incessantly fulfilled their purpose; and if one estimate were made of the cost of construction and repair, in stone or brick, after the Roman manner, and another upon any system of tubes capable of delivering the same quantity of water, their liability to obstruction, to bursting, and to loosen at the joints, their wear and tear, including loss by age and by decomposition, with the generally necessary expense of steam power, the balance would be found infinitely in favour of the method described in the preceding pages, without taking into consideration, that good water loses its quality in metal tubes, while even inferior water is improved while running in a brick or stone channel; besides the above, there are all the inconveniences produced by inequality of pressure in the pipe system, the deleterious effects of the metals employed, and the necessity of taking up whole lengths of mains laid under the solid pavement of our streets, which are rendered impassable during the works; such an inconvenience the Romans wisely avoided, and continued to prefer the system of raised aqueducts even to that of pipes in vaults (patented by JOHN WILLIAMS, *Historical Account of Subways in the British Metropolis*, 8vo., Lond., 1828). The only chance of accident would be the leakage produced by the settlement of a division of the arcade, and this would instantaneously discover itself. In Central America the conduits were provided double, as was the case at Metz; and the Roman legislation decided that the aqueduct should be unincumbered for fifteen feet on each side in the country, and for five feet in towns.

MR. BURNELL has already made the following just observations, that—"As for the comparison of works of art, the moderns do but make a small figure, when we take into account the great superiority of their means of mechanical execution. With the exception of the Marseilles and Caserta aqueducts, of late no constructions of this kind can be said to rival the works of the Romans in all the magnificence of their details. Even at the present day, the student who would wish to examine the problems connected with the conducting of large streams, could not find better examples or better subjects for examination than the Roman aqueducts. For we may safely assert, that if we examine such works merely from an artistic point of view, we are immeasurably beneath our predecessors in the taste with which we have designed them. Considering them as objects of scientific investigation, we are far from having derived any important benefit from the advancement of the physico-mathematical sciences which has taken place since the revival of learning."

Translated, with additions, by J. W. PAPWORTH, from the MS. of
SERVAAS DE JONG,
(Amsterdam, 1852.)

The following works may be further consulted:—ANDRÉOSSI, *Constantinople*, etc., Paris, 1828; THE ARCHITECT JOURNAL, for 1850; BERBRUGGER, *Algérie Historique*, etc., fol., Paris, 1843 (which contains illustrations of several aqueducts); BURGESS, *Topography*, etc., of Rome, 8vo., Lond., 1831; CANINA, *Architectura Ant. Romana*, Rome, 1834; CASSIO, *Corse dell' Acque*, 4to., Rome, 1756; FABRETTI, *De Aquis*, etc. *Veteris Romæ*, 4to., Roma, 1680; FRONTINUS, *De Aquæductibus Urbis Romæ Commentarius*, by RONDELET, Paris, 1820; GENIEYS, *Essai sur les Moyens de Conduire*, etc., les Eaux, 4to., Paris, 1829; GUYS, *Voyage Littéraire de la Grèce*, 8vo., Paris, 1776; MURRAY's *Handbooks for Spain, Italy*, etc.; POCOCKE, *A Description of the East*, fol., London, 1743-5; POLENI, *De Aquæductibus*, etc. (Frontinus), 4to., Patav., 1722; WIEBEKING, *Theor. pract. buerg. Baukunde*, 4to., Munich, 1821-7; WIEBEKING, *Analyse Descriptive*, Munich, 1838.

AQUEDUCT PLATE I

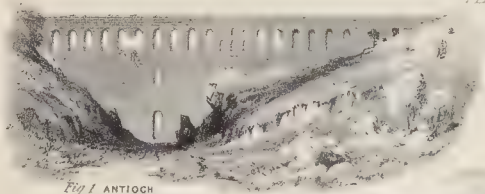


Fig. 1. ANTIOCH



2. LLAMUS



3. LLAMUS



4. LLAMUS



5. ANTIOCH



6. CESAREA

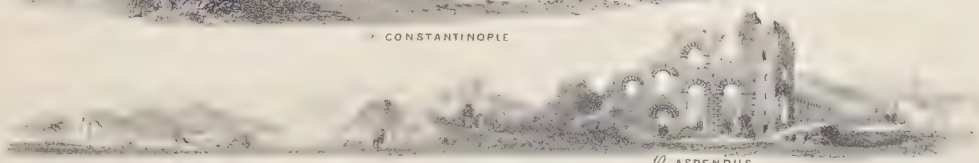


7. MYTILENE

8. ANTIOCH



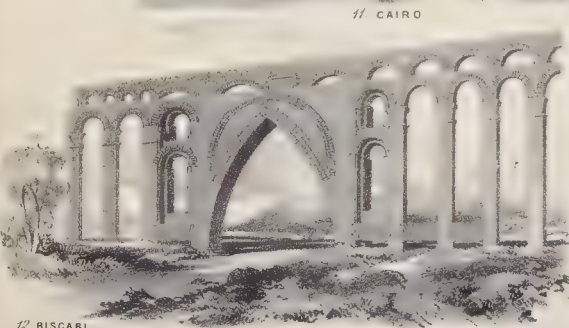
9. CONSTANTINOPLE



10. ASPENDUS



11. CAIRO



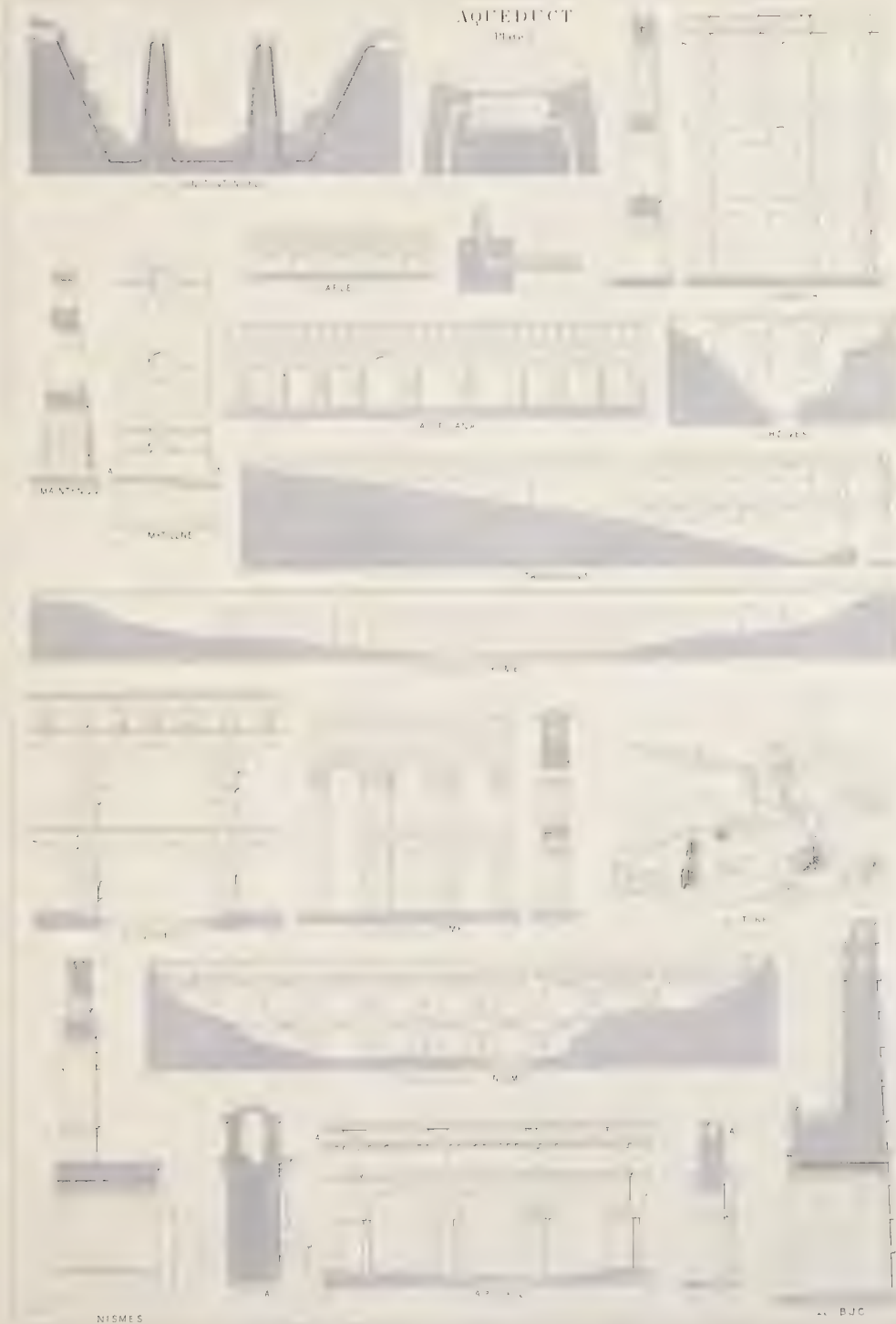
12. BISCARI



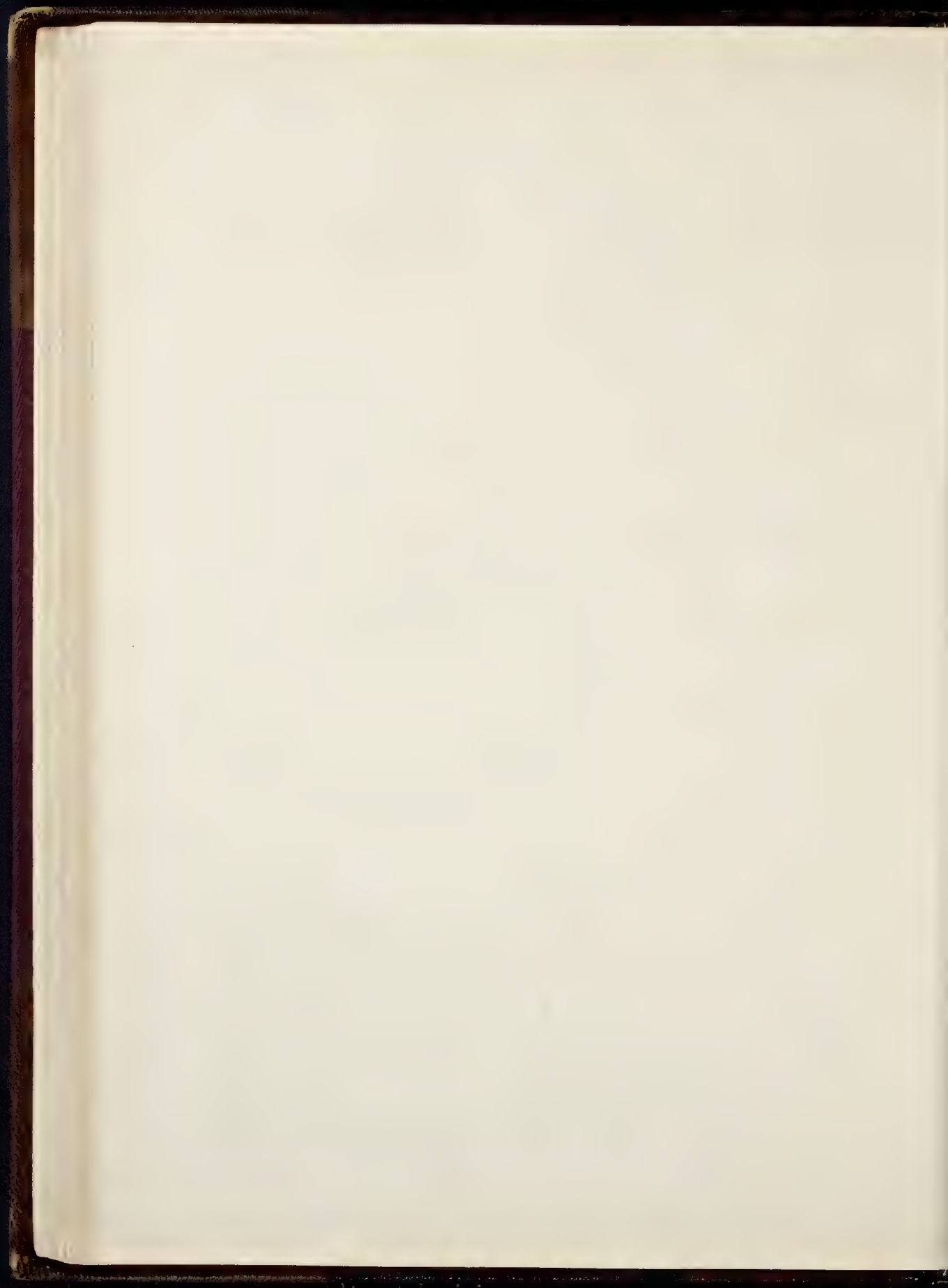
13. SEGOVIA



AQUEDUCT
Plate

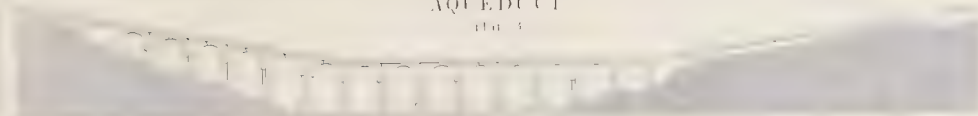


Designed by W. H. R. H. and J. H. H. H.



AQUEDUCT

FIG. 1



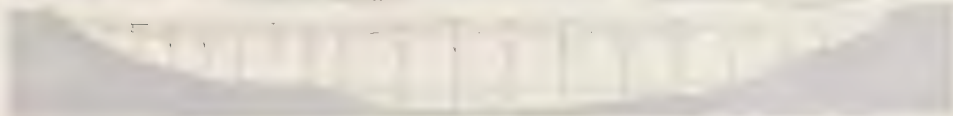
PERSPECTIVE



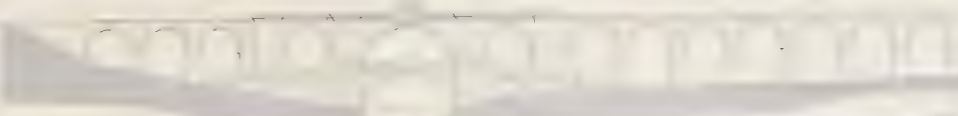
PLAN



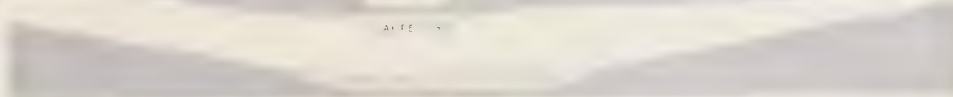
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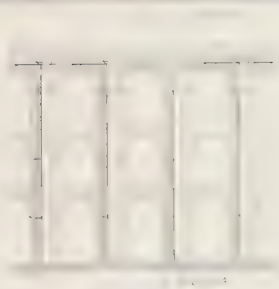
SIDE ELEVATION



PERSPECTIVE



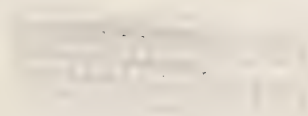
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SECTION



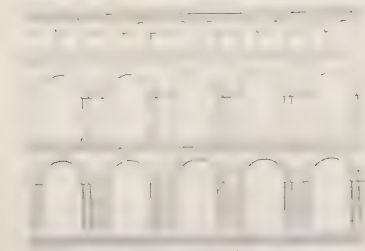
SECTION



PLAN



PERSPECTIVE



SECTION



SECTION



THE

DICTIONARY OF ARCHITECTURE.

BAAL

BAALBEC, BAALBEIT, BAALBEK or BALBEC, called at the period of the decline of the Roman empire Heliopolis of Coëlesyria. A city situated at the north-east extremity of the plain called Bokat or Bekah, which extends from Mount Libanus to the Mediterranean sea. The remains have been considered important enough to rank amongst the wonders of the world, on the credit given to the many and contradictory descriptions published by travellers; but the following account, contributed by Sir Charles Barry, R.A., from his notes made on the spot in 1819, is authoritative.

The walls of the ancient city, with towers at short distances, may perhaps exceed three miles in circumference. The nature of their construction with small stones, and the number of architectural fragments built into them, render it probable that they were the work of the Saracens, erected perhaps on the old foundations of a more ancient boundary. When complete, the walls were from 15 to 20 feet high.

The Acropolis, near the western boundary of the city, is of an irregular form, covering about six acres of ground, extending from east to west about 740 feet, and from north to south about 470 feet. It is raised generally about 25 feet above the city which formerly surrounded it, except at its north-west angle, where it is about 25 feet higher, forming a site for the great temple of Apollo or that of the Sun, 270 feet by 165 feet. The substructions appear to be wholly artificial, and formed of stone carefully worked and constructed, but set without mortar. Beneath the site or platform of the temple of the Sun, at the north-west angle of the Acropolis, are stones of extraordinary magnitude, forming a stylobate to the temple and at the same time part of the external walls of the Acropolis. Eleven blocks, on the north side of the substructions of the temple, measure 250 feet in length, or each upon an average nearly 23 feet in length, 13 feet in height, and about 10 feet on the bed. They form one continuous course of the wall, and are placed at an elevation of about 18 feet above the plain. Large as these stones are, there are three others, in a continuous course and at the same elevation above the plain as those already alluded to, forming a part of the stylobate of the temple to the west, which together measure the extraordinary length of 182 feet, or upon an average nearly 61 feet each, and of the same height and dimensions on the bed as those already described. (Note, A)

There are three vaulted passages, 18 feet in width, through the substructions of the Acropolis, two running east and west, within about 24 feet from the face of the external walls; and the other running north and south, about 65 feet from the eastern external face of the Acropolis, and communicating with the two former. These vaulted passages or galleries are constructed of immense blocks of stone, which appear to have been

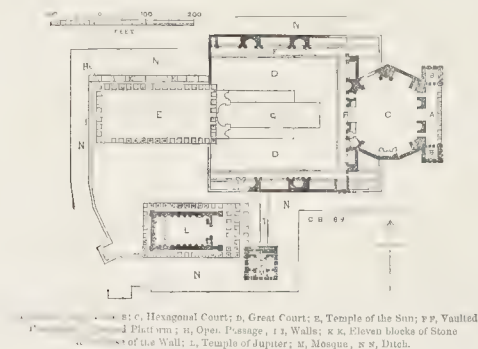
BAAL

set in a rough state, though with beds and joints remarkably true, and faced subsequently, which latter operation is only in part completed. In their vaulted ceilings are deeply sunk panels, containing apparently the busts of Roman emperors, too much dilapidated and too ill-lighted to discover their identity. There are some appearances of Roman paving, forming a chariot road and footpath on each side of it. The northernmost of the two first mentioned passages passes entirely through the Acropolis, whilst the other appears to have led into the midst of it. At the eastern extremity of the last mentioned passage, near its entrance on the south side and in the intervening space between the passage and the exterior of the Acropolis, is a small door leading into an open court which communicates with a vaulted chamber. This chamber is decorated with a pannelled ceiling enriched with roses; one end of it is formed of pilasters of a plain character supporting an entablature, and at the other appears what may have been either a window opening into a second court, or a niche flanked by a smaller niche on each side of it, raised on a plinth, and surmounted by a pediment richly molded and carved. In the segmental lunette at each end of the chamber are sculptured panels formed of many figures in high relief, but they are so ill-lighted and dilapidated as to render it impossible to discover their subjects. On each flank of the chamber is a low pediment and projecting pedestal, occupying nearly the entire length of it, and profusely carved in its architectural decorations. I observed only one other doorway in these vaulted passages, not far from the door already mentioned, but it is now blocked up. (B)

The Acropolis seems to have been occupied almost exclusively by two Corinthian temples and their appendages. The larger, or that supposed to be dedicated to the Sun, occupies the north-west angle of the Acropolis, the smaller being about 130 feet to the south of it, is supposed to have been dedicated to Jupiter. The approach to the great temple was by means of a flight of steps, now entirely demolished, from the former lower city, 125 feet in width, and rising about 25 feet to a portico in antis of a similar width, and about 35 feet in depth; this portico is flanked by towers 40 feet square, in which the order is repeated. (C) The columns of the portico, 12 in number, were 4 feet 3 inches in diameter; the pedestals only now remain, and bear inscriptions of dedications to the gods of Heliopolis. There are openings at each end of the portico into the towers, formed by square pilasters. In the external walls of these towers are two stories of square recesses or *ædiculæ*, with highly enriched dressings.

In the back wall of this portico or loggia are three entrances, the central one being about 26 feet wide, leading to an hexagonal court, 130 feet from east to west, and 154 feet from north to south. In the north and south sides of this court are two

deeply recessed exhedrae, about 50 feet long and 20 feet deep, the walls of which are decorated with two stories of square niches, and have highly enriched dressings. Those in the upper story are surmounted by angular and segmental pediments alternately. The fronts of these exhedrae appear to have been closed by a screen of columns in antis, 2 feet 9 inches in diameter.



On the western side of this hexagonal court are three doorways similar to those on the eastern side, leading to a quadrangular court, 300 feet from east to west, and 275 feet from north to south in the clear. On the north, south and west sides, are eight exhedrae of similar size and decoration to those in the hexagonal court; those on the north and south sides are separated from each other by semicircular alcoves, 25 feet in diameter, with domed heads. In the centre of the east side of this court stands the great temple, elevated upon a stylobate about 25 feet high, and approachable from the court by what appears to have been an incline or a flight of steps projecting into it about 165 feet, and having a width of nearly 100 feet. (D)

The great temple now consists of indications of a peristyle only of columns occupying an area 255 feet long and 125 feet wide. It is octastyle and of the Corinthian order, having had 17 columns on the sides, but of which six only are standing. The entire order is about 88 feet in height, of which the columns with their bases and capitals measure nearly 70 feet; the base and sub-plinths of the columns are together 7 feet 2 inches in height; the lower diameter of the shafts, which are plain and in three blocks of stone 55 feet 4 inches in height, is 7 feet 5 inches, and the capital is 7 feet 2 inches in height. The central intercolumniation of the east front is 13 feet 9 inches, the others are 8 feet and 8 feet 10 inches wide. The bedding joints of the columns have square mortices for plugs probably of metal, 12 inches square and 12 inches high. (E) The architrave has three fasciae with its moldings richly carved; the frieze is of unusual height, and is enriched with cantilevers supporting kneeling bulls and crouching lions alternately, about 21 inches apart. The cornice, consisting of a cymatium with lion's heads at intervals, of a corona, modillion band with modillions, a dentil band and the usual bed moldings, is richly carved and profusely ornamented. There are no indications within the peristyle of any walls denoting a cella to the temple. (F)

The smaller temple, or that supposed to have been dedicated to Jupiter, is in great part entire, and is 205 feet long and 112 feet wide. It is octastyle, and has had 15 columns in flank, a triple row of columns to the pronaos, and no posticum. (G) The order of the temple, which seems in its proportions and decorations to be generally a copy on a smaller scale of the great temple, is Corinthian, and cannot have been less in height than 74 feet. There are 16 columns of the peristyle with their entablature standing; (H) their lower diameter is 6 feet 5 inches, the square of the plinth 7 feet 9½ inches, and the height of it 16½ inches. The height of the base is 22½ inches, the shaft is

49 feet 6 inches, and the height of the capitals and entablature are in proportion. The central intercolumniation of the east front is 11 feet 6 inches, and the others are 8 feet. The columns on the east front only are fluted, but it is probable that the whole of them were intended to have been so enriched, as the neckings of many of them are left unfinished. The internal columns of the pronaos, and the antae which answer to them on the walls of the cella, are of less height and decoration than the columns of the peristyle, and are surmounted by an entablature surrounding the walls of the cella, the top of which reaches to the level of the top of the architrave of the external order, at which level is a segmental vault, divided into hexagonal, rhomboidal and triangular panels, the two former being filled with busts of emperors, empresses, deities, fish, insects, etc., and the latter with foliage enrichments; the margins and moldings of the panels throughout being highly decorated with carved enrichments. Both the external and internal entablatures of the surrounding porticos are equally profuse in their enrichments, the necking of the capitals of the inner order is continued round the walls of the cella, and at the height of four feet above the floor is a plat band surbase, on which the meander enrichment is beautifully designed and executed.

The entrance doorway in the east front of the temple is 42 feet 10 inches high and 21 feet wide, and is profusely decorated with carvings. The architrave, which is above 4 feet wide, consists of nineteen members, two of which are in broad fasciae, the one being decorated with flowers and ears of corn, and the other with entwined grape branches and leaves having male and female dancers and other figures within the tendrils, and so undercut and drilled as to produce a high degree of relief and great richness of effect. The frieze has a laboured scroll enrichment, on which are blended various animals. A richly molded double cornice, supported by molded and enriched consoles, surmounts the architraves which form the lintel. There are no less than ten members in the cornice, decorated with the usual architectonic carvings. The corona is supported with molded and carved modillions, having intervening panels and roses in the soffit of it. The cymatium (a cyma recta) is enriched with the honeysuckle and acanthus leaf alternately. The architrave, forming the lintel, is in three blocks; the central block has dropped from its true position nearly 4 feet (I); the soffit is enriched with sculpture in high relief, representing the Roman eagle with extended wings, with the caduceus in its claws; on each side are Cupids, designed with great spirit, and holding garlands of flowers tied together and passing through the beak of the eagle. The general treatment of the style and decorations of this doorway, evinces great imagination and power in the mind that conceived it.

The interior of the temple, 115 feet long including the secos at the west end, and 70 feet wide, when viewed from this superbly decorated doorway as a frame to the picture, has an air of great magnificence. At the west end of it, to the depth of 28 feet, and at an elevation of about 8 feet from the floor of the rest of the temple, is a raised floor to the secos, which was divided from the remainder of the cella by a screen of three arches now demolished, the central arch being 35 feet wide, but the springing stones in connection with the external walls still exist. On the rear wall in the centre are two Corinthian pilasters, 35 feet apart, and two half-pilasters in the angles. In the centre appears to have been a recess, having four square pilasters with an entablature and pediment surmounting them, of which the pilasters alone remain. The walls at the ends of the secos are also decorated with pilasters. The piers of the great archway before described have a pilaster at the back, and three-quarter engaged columns in front of them. The inter-pilasterations at the ends of the secos have two stories of square recesses, treated as windows in respect of their dressings; those in the lower story have semicircular heads, and those in the upper story are square with pediments, and have blocks in the sills, apparently for statues. Each flank wall of the remainder

of the interior has six engaged fluted columns of the Corinthian order, backed upon projecting piers of a thickness answering to their diameter, and two geminated columns on piers, form each of the eastern angles. The entablature, which is carried entirely round the interior of the cella, breaks over each projecting columnar pier. In the intercolumniations are two stories of square sunk recesses, with dressings similar to those already described as enriching the end walls of the secos.

On each side of the entrance door, at the east end of the temple, is a wide Corinthian capped pier or pilaster of great projection; in one of which is a winding staircase leading to the top of the building. (κ) Of the roof, which was probably of wood, not a vestige remains, or any indication of a ceiling. (ι) The decorations of the internal order of the cella, and of the dressings of the recesses (probably for statues) in its walls, are of the same lavish and exuberant character as those of the exterior, and the temple altogether is perhaps the most profusely decorated example in existence of the period of the decline of the Roman empire. (μ)

At the south-east angle of this temple there are substructions of a tower, being part of the walls of the Acropolis, on which has been erected, with great care in its construction and of large blocks of stone, a mosque 70 feet square, but formed internally into a Greek cross by means of square chambers in the angles. The building has two stories; the lower one lighted by loopholes, but very dark and much encumbered with stone and rubbish; the upper, which assumes the form of a cross, is vaulted and lighted from an opening in the dome of the crociera. The chambers in the angles upon this story are lighted by loopholes in the external walls, and have a raised dais in each of them. This and the surrounding walls and towers built on the Acropolis, together with the stone vaulted chambers within it, of which the ruins still exist in great abundance, are doubtless the works of the Saracens, when the Acropolis was converted into a citadel; at which time, it is probable that it was surrounded by a moat, about 30 feet wide, still existing, and through which now runs a stream of clear water.

At a short distance southwards from the citadel, and in a line with its eastern boundary, is a remarkable circular Corinthian temple, of the same period, and equally exuberant in decoration as the temples already described. The cella of this temple is circular within, and is surrounded externally by a peristyle of six columns 3 feet 1 inch in diameter, answering to pilasters on the cella, to the extent only of two-thirds of its circumference, the chord of the remaining portion of the circle having been occupied by a tetrastyle portico now destroyed. The entablature of the order breaks over each column of the circular peristyle, and is incurvated to the wall of the cella at every columniation, producing great movement in the sky line of the building and a very picturesque effect. The doorway has been very large, and the temple has probably been covered by a dome. In each of the intercolumniations externally is a circular niche, with Corinthian pilasters and richly molded architrave. In the bottom of the niche is a pedestal for a bust; one of them, though much defaced, still exists. In the domed head of the niches are bas-reliefs of varied design; in one the Roman eagle appears. In the interior walls of this temple are two stories of square sunk recesses with dressings profusely decorated, as before described with reference to those of the smaller temple on the Acropolis. (ν)

At the north-western extremity of the ancient city the ground rises to a considerable height above the level of the Acropolis; on the summit of this rising ground are the ruins of an insulated Doric column, resting upon a pedestal about 6 feet high, and a base of three or four broad steps. The shaft appears to have been formed of sixteen stones, now lying on the ground; on one of them, occupying its entire circumference, are carved five festoons of laurel with intervening ox skulls, which appears to have occupied the upper portion of the shaft. A deep groove extending throughout the whole height of the column and pedestal, 6

inches wide and 4½ inches deep, has given rise to the supposition of its having been a clepsydra. On the top of the acacus of the capital is a mortice, 2 feet 4 inches by 2 feet 1 inch, and 10 inches deep. The entire height of the monument is 33 feet 10 inches, and the greatest diameter of the column 4 feet 10½ inches.

About 50 yards from the ruin of this monument is an enormous slab of stone of great thickness, having a regular entablature with a pediment, acroteria and antefixæ, on each side of its four edges, and a flat dome with a rose in high relief within a deep sunk panel forming its soffit. This slab appears to have been supported as a canopy at its four angles by columns, and has moldings and other decorations profusely carved.

About 375 yards to the north-north-west of the Acropolis appear the substructions of a gateway of considerable importance, much encumbered by ruins. It appears to have had three openings, that in the centre being much larger than the others; and also to have been flanked by wing buildings, the foundation of each of which is formed of one huge block of stone.

To the south-west of the city, about a mile and a half distant, are two enormous quarries, which doubtless supplied it with stone; it is calcareous and of a dark cream colour, receiving, as appears from the existing ruins, a warm and rich yellow hue by exposure to the effects of the atmosphere. In one of them appears a block of stone, 69 feet long and 14 feet square, worked on three of its sides, but still attached to the rock by its bed; near it are two vertical insulated piers of great size, which have been quarried all round them, and not relieved from their bed. The sides of the bared rock attest the great sizes of the blocks of stone which have been detached from them, but in no instance did I observe any indication of the use of wedges for quarrying purposes. From a computation which I made on the spot in the year 1819, the yield of stone from these quarries cannot have been less than 870,000 cubic feet. c. b.

The following notes exhibit the leading discrepancies which have been published.

(A) According to WOOD, they are twenty in number in the bottom course, which includes the base of the stylobate; sixteen of these are from 31 feet to 38 feet long, by 13 feet high, and 10 feet 6 ins. thick in the die: one block is shorter than these, but above them, in the middle of the die, at the north-west corner, and more than twenty feet from the ground, are three still larger blocks (which perhaps gave the name of the "trilithon" to the temple, for it would hardly be remarked that the columns were each in three blocks), of 63 feet, 63 feet 8 ins., and 64 feet, respectively, according to WOOD, whose measurements differ from those given by POCOCKE, of two stones, one 62 feet, and the other 62 feet 9 ins. long. There is a curious remark by RICHARDSON with regard to these stones, to the effect that "the second builders of this enormous pile have built upon the foundations of the former building, and in order that the appearance of the whole might seem to be of one date, they have cut a new surface upon the old stones: this operation has not been completely finished, and some of the stones remain half cut." The same author states the height of the largest blocks to be 14 feet, and their depth 9 feet, adding, that they also have been partly refaced; and he is perhaps the only writer who mentions the anglet of rustication at the joints of the masonry.

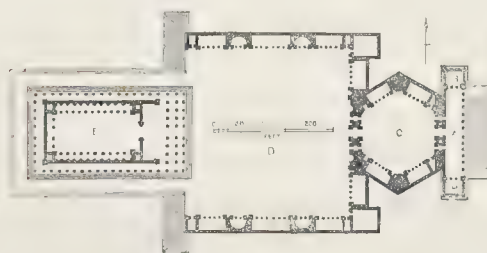
(B) DE LA ROQUE speaks of long staircases, some having two hundred steps, leading down to chambers, halls, and other apartments, in perfect condition, partly lighted from the outside, and containing numerous marble tombs, niches, busts, and inscriptions, among which latter he quotes "*diviso mosci*". MAUNDRELL mentions the words "*divis*," "*mosc*," but does not clearly state the locality in which he saw them; DE MONCONYS, i, 349, says they were in the left hand gallery under the quadrangular court.

(c) According to DE LA ROQUE, i, 124, the propylæum had two front towers, with engaged Doric columns between them, and three grand entrances in front: he adds that this building was doubt, and extremely deep, with two similar towers on the western side. The principal coins relating to the edifices in this city are to be found in WOOD; SMITH'S *Dictionary*; and the PENNY CYCLOPÆDIA, s. v.

(d) In the middle of the quadrangle there was a small square space on which LORD LINDSAY and VOLNEY saw the foundations of some building. It is very curious that this latter author and DE LA ROQUE insist upon the level of the hexagonal altar being lower than that of the quadrangular one, whereas WOOD does not show any difference between them; and, indeed, it would be difficult to accommodate the similar design of the two courts to an altered level. DE LA ROQUE, moreover, states that "ces édifices sont élevés sur un double rang de colonnes qui forment deux superbes galeries en portique aux côtés de cette grande place"; but it is as difficult to believe that he saw either two tiers or two ranges of columns, as to understand LORD LINDSAY's statement that, from the hexagonal court, the visitor "passing into a second, 350 feet square, and ascending a flight of steps, he proceeded under a double colonnade to the grand portico."

(E) These sockets being found in all the fallen fragments of the temple, would make it appear that each stone was thus secured in its place, but with smaller dowels than those in the shafts. How much this method of connecting the stones contributed to the strength of the building, is shown by a column which has fallen against the wall of the cella of the smaller temple; part of the shaft is destroyed, though its joint has not been in the least opened by the shock. THEVET, *Cosmog. Univ.*, fol., Paris, 1575, vi, 14, observes that some of the columns had been taken to Constantinople for the mosque of Sulciman the Great, between 1551 and 1566. DE LA ROQUE, POCOCKE, and WOOD describe nine columns standing, but since the time of VOLNEY only six are mentioned in the other works cited at the end of this article. WOOD shows that the capitals were finished in the time of Caracalla.

(F) The sacred edifice was presumed by CASSAS to have been decastyle peripteral, with nineteen columns on the side, and a second and a third range before antæ in the pronaos, no posticum, but two ranges of ten columns in the cella and four at the west or return end. But it is not clear that the building was ever completed, for according to LORD LINDSAY "not a trace remains except a line of stones that perhaps marked the cella."



(G) Presumed by CASSAS and by WOOD to have been octastyle, with fifteen plain columns on the side, and peripteral, with six columns in the second rank, and one column also plain, standing before each anta in the third rank of the pronaos; and not to have had a posticum. LABORDE and also ROBERTS show two fluted columns before each anta; while DE MONCONYS, MAUNDRELL, and DE LA ROQUE, only seeing fourteen columns on the side, state that the front had eight (evidently a mistake for six) fluted columns, standing thirty feet from the doorway, with four



other columns, in a second range, between the antæ; the exterior walls of the temple were ornamented with sculpture, of figures and animals, according to DE MONCONYS and DE LA ROQUE. The marble steps to the front were perfect in 1688.

(H) Twenty-nine columns were seen by WOOD, but VOLNEY only counted twenty, and calculated thirteen on each flank, and eight on each end. LABAT, *Mémoires du Chev. D'Arvieux*, 12mo., Paris, 1735, ii, 439, states, "this portico is supported by thirty-four columns, of which the four on each side of the door are of the Corinthian, and the rest of the Ionic order." BLONDEL, *Deux ans en Syrie*, 8vo., Paris, 1840, could only calculate twelve columns on each flank, and six in each end.

(I) The earthquake of 1759 caused the middle stone of the soffit to drop eight inches, according to VOLNEY and ADDISON; but LABORDE shows it as having dropped at least two feet, and ROBERTS shows a drop of four feet.

(K) DE LA ROQUE declares that the topmost stone contained twenty-nine steps.

(L) POCOCKE, MAUNDRELL, and DE LA ROQUE mention the isolated columns forming a nave and aisles; but WOOD has omitted them, being of opinion that they were added when the building was converted into a Christian church, A.D. 379.

(M) It is only just to DE LA ROQUE to remark that he is the sole writer who mentions the remains of buildings which were approached at each corner of the basement of this temple, by means of the marble steps which he saw, broad enough for eight or ten persons abreast, and by others which led down to the ground floor of the buildings, which was lighted by windows. MAUNDRELL confuses the two temples by describing the smaller one in place of the larger one, unless his arched avenue, or portal, 150 paces long, has disappeared.

(N) It has been converted into a Christian church, dedicated to Sta. Barba, but has been many years in ruins. DE LA ROQUE says that the interior was an octagon, with large columns at the angles. It seems that the diameter of the rotunda might have



From Cassas.

given the radius of a circle, and that the same length, increased by half being used as a chord line to that circle, gave the position of the two outer columns of the inner range of the portico: the situation of the other columns would then be merely a matter of division, as the plan does not depend upon an octagon described within a circle. The projecting tetrastyle portico, shown by CASSAS as standing at the top of sixteen steps, is not given by WOOD; the interior diameter is about 32 feet. This building has been imitated in the "Temple of Apollo", erected at Stourhead in Wiltshire, by Sir R. C. Hoare, Bart.

These buildings afford numerous examples of pilasters projecting only one quarter of their width, of angle modillions, of acorned dentils, of coupled columns, of varied intercolumniations, of broken and curved entablatures and portions of entablatures, of heads of niches filled in with gigantic shells, of pediments inserted in other pediments, and with tympana as well as straight and raking cornices broken and interrupted, and even of pieces of pediments put as acroteria on the tops of single columns; at least, if WOOD and DAWKINS are to be trusted in the details of their illustrations, for CASSAS has given important variations from their work, accompanied by contrasted reductions of their plans and his own. The engravings given by the former were made from very meagre sketches, and are said to have been checked by the latter on the spot, but his plates of the smaller temple seem to have been copied from the English work.

The numerous busts and statues required for the decoration of these buildings, and of the circular temple to be noticed, had entirely disappeared in the time of POCOCKE; but DE LA ROQUE asserts that in his time there were quantities of statues and busts with caryatides and terminal figures.

Remarkable points of similarity between the two temples,

such as the detail of the external order, especially the frieze, render it not an improbable supposition that one was a copy from the other. Among points in the small temple which exist without duplicates in the larger one, are the ornamental frieze or platband under the raking cornices of the pediments, the intricate Greek fret of the subbase of the stylobate, and the very unusual manner in which the order of the pilasters, serving as antæ, is made much less in height by a pedestal and entablature than that of the external columns; these pilasters have no bases, and the height of the frieze is only half that of the architrave.

Sir THOMAS DEANE, as reported in the *BUILDER Journal*, ix, 60, observes of the ornamental work from Baalbec in his collection, that the formation of the foliage, and the production of effect by deep shadows and undercutting, was owing to an artistic use of the drill.

(o) In the environs of the city there is a Mohammedan sepulchre, of an octagonal form, the dome of which is supported by red granite columns about 19 ins. in diameter: a column of the Corinthian order, standing in the plain about six miles from the city, is also mentioned by POCOCKE as being composed of fourteen blocks of stone, each about 3 feet high, and standing on a base of five steps, altogether 6 feet 3 ins. high. FRANKLAND, *Travels*, etc., 8vo., London, 1829, says seventeen blocks, and 60 feet high.

With regard to the present condition of Baalbec, ADDISON and LORD LINDSAY observe that, although nominally the seat of a Greek bishopric, the village, situated to the eastward of the ruins, is little more than a heap of rubbish, though still refreshed by the aqueducts which are in full flow.

DE MONCONYS, *Journal des Voyages*, 4to., Lyons, 1665; MAUNDRELL, *Journey from Aleppo* (in 1696), 8vo., Oxford, 1703; DE LA ROQUE, *Voyage* (in 1688), 12mo., Paris, 1722; POCOCKE, *Description of the East* (in 1738), fol., Lond., 1745; WOOD and DAWKINS, *Ruins of Balbec*, fol., London, 1757; CASSAS, *Voyage Pitt. de la Syrie*, fol., Paris, 1798; VOLNEY, *Voyage en Syrie*, 8vo., Paris, 1787; RICHARDSON, *Travels* (in 1783-84-85) 8vo., Lond., 1822; ADDISON, *Damascus*, etc., 8vo., Lond., 1838; MARMONT, DUC DE RAGUSE, *Voyage en Hongrie*, etc., fol., Paris, 1839; LINDSAY (Lord Lindsay), *Letters on Egypt*, 8vo., Lond., 1847; WILSON, *Travels*, 8vo., Lond., 1847, is perfectly unintelligible; CROLY, *The Holy Land*, etc., illustrated by D. Roberts, R.A., fol., Lond., 1845.

BAASHEIKHBAAH, or BAASHEIKHAAH, see NINEVEH.

BAAZ GUERGANG. The native name of CARPINUS betulus, a wood of Turkey used for rough work. 71.

BABICOMBE MARBLE, see DEVONSHIRE MARBLE.

BABYLON (in Arabic *Baboul*). A town upon the river Nile in Egypt, of sufficient importance during the first ten centuries of the Christian era to be the seat of a bishopric; it is the Babylon which was the favourite residence of S. Peter, and is often confounded with the city of the same name on the Euphrates. Captive Assyrians were probably the first inhabitants of the Egyptian town, remains of which, or rather of its fortifications and aqueduct, are still visible a little to the north of *Fostat*, Misra-el-alik, or Old Cairo. DESCR. DE L'EGYPTE, *Antiquités*, texte v.

BABYLON. The ancient capital of the Chaldeo-Babylonian empire, which, from the description by HERODOTUS, i, 178-187, after personal observation, has been considered one of the most famous cities in the world; yet, although known to have been situated on both sides of the river Euphrates, it was so completely annihilated before the third century of the Christian era, that tradition alone was the reason for seeking its position near the modern town of Hillah, about fifty-four miles south of Bagdad, on a site of which the boundaries are variously given. As nothing of importance to the architect has yet been discovered, beyond some indications of the date of the buildings which formed these mounds, it will be sufficient to

mention the works which may be consulted for an account of the recent condition of the ruins, and to point out the confusion as to names which has arisen since. Although geographers are now agreed upon the site, they have given different names to the mounds in that vicinity. LAYARD, *Nineveh and Babylon*, 8vo., Lond., 1853, observes that "the most accurate and careful description is that by RICH; in the collected edition of his memoirs, entitled *Narrative of a Journey to Babylon*, etc., Lond., 1839, will be found an interesting summary of the researches and discoveries of previous travellers"; and adds that "a correct survey of the ruins is much wanted". Fourteen miles north of Hillah, at the village of Mohawill, is the commencement of a mass of scattered mounds, at the termination of which is a ruin which LAYARD says is called *Babel* by the Arabs, and the *Mujelibe* by RICH and his followers. This stands at the northern extremity of an enclosure about two miles long, from the river eastward, and about three miles in length from the Mujelibe southward, in a line running nearly north and south. Hillah is situated about three miles south of the enclosure. In the enclosure are three principal mounds, the northern is called the north-east or lesser palace by RICH; the southern is the hill of *Amran-ibn-ali*, sometimes called *Junfuma* by LAYARD; and between them, but to the east, is the ruin called *Kasr* by RICH and his followers, but *Mujelibe* by others. About eight miles east of the *Kasr* is the mound called *El Heimar* or *Hymer*, and eight miles south-west of the same ruin is the celebrated *Birs Nimroud*, from which, according to LAYARD, every brick as yet removed bears the name of Nebuchadnezzar, the same being the case at his *Babel*, *Mujelibe*, and *Hymer*. RAWLINSON (*Athenæum Journal*, 18 March, and 15 April, 1854) states that the public works attributed by HERODOTUS to Nitocris were certainly executed by Nebuchadnezzar; that many bricks have been lately found at Babylon by the French Commission, bearing the name and titles of Nergalsharezar; and that the walls of Babylon, on the river face erected by Nabbonad, were completely exposed during a recent fall of the river, and the bricks of which the wall was composed were found to be uniformly stamped with his name and titles. The same author thinks the *Hymer* brick, published by KER PORTER, 77a, as something "up to the present time altogether *sui generis*."

The description given of the city by HERODOTUS is well discussed, and compared with the statements made by other ancient authors, in SMITH, *Dict. of Greek and Roman Geog.*, s. v. The observations of RICH should be compared with those of KER PORTER, *Travels in Georgia*, etc., 4to., Lond., 1821; BUCKINGHAM, *Travels in Mesopotamia*, 8vo., Lond., 1829, who notices that the *Kasr* of RICH is sometimes called *Babel*; MIGNAN, *Travels in Chaldea*, 8vo., Lond., 1829; AINSWORTH, *Researches*, 8vo., Lond., 1838; by whom the proposition of changing the names generally given to the mounds was made, and whose dimensions vary considerably from those of other writers: FRASER, *Mesopotamia*, etc., New York, 1845; and CHESNEY, *Expedition*, etc., 4to., Lond., 1850; FLANDRIN, *Voyage en Perse*, 8vo., Paris, 1851, ii, 513.

BABYLONIAN ARCHITECTURE. As the inscriptions which have already been discovered and interpreted, announce according to RAWLINSON (*Athenæum Journal*, 18 March, 1854) the execution, under several monarchs, of buildings, repairs, and extensive hydraulic works, it is desirable to supply, as completely as possible, a statement of the succession of the monarchs whose names will hereafter fix the dates of the works in which an architect is interested.

RAWLINSON writes that "authentic Babylonian chronology dates from the latter half of the twenty-third century B.C. The precise duration which Berosus assigns to the original Median dynasty of Babylon, and to the *Scythians* who succeeded them, cannot be determined. The Chaldean monarchy, however, which followed, was established about B.C. 1976, and continued till B.C. 1518; and it is to this interval of four hundred and fifty-eight years that we must assign the building of all the great

cities of Babylonia and Assyria, in the ruins of which we find bricks stamped with the names of the Chaldean founders." Of this dynasty about twenty monarchs are now known, including Ismidakan and his son Shamasphal, who founded, about B.C. 1840, a temple at Kalah Sherghat.

Of the *Arab* family which followed this, and was with it paramount over Assyria, RAWLINSON suggests that the only memorial yet to be ascribed to it may be a brick from El Hymer near BABYLON.

In the *middle Babylonian* dynasty, from B.C. 1273 to B.C. 747, the name of Merodan-adan-akhi is the only one yet published.

According to RAWLINSON (*ATHENÆUM Journal*, 1854) an inscription found in the south-east palace at Nimroud, leads to the supposition that the Atossa, or Semiramis I, of the Greek historians was the daughter of a king of the Medo-Armenians, who reigned with her husband Phallukha, as joint monarch, at Nineveh, until his death, and afterwards became the sovereign of Babylonia. RAWLINSON does not explain this interference with the Nabonassar next to be mentioned, unless by the observation that Tiglathpileser of Assyria killed Neborasappam of Babylonia, B.C. 746; and thence it might be inferred that Semiramis, as guardian of her son Ninus II, or Ninyas, might have ruled, under the name of Nabonassar, for the fourteen years stated as the length of his reign. Some writers regard the period of Phallukha's death as that of the fall of the Sardanapalus of Greek historians.

The *lower Babylonian* dynasty, according to the canon of PTOLEMY, which very well agrees with the inscriptions as read by RAWLINSON, comprises Nabonassar, who is said by SYNCELUS, *Chron.*, 207, to have destroyed the memorials of preceding monarchs, and whose celebrated era began B.C. 747; Nadius, 733; Cincirus, Chozirus or Porus, 731; Jugæus or Ilulais, 726; Mardokempadus, the Merodach Baladan of Scripture, 721; Archianus or Arkeanus, brother of Sennacherib, king of Assyria, 709; Hagisa or Acises, 704; Mardokempadus restored, 704; Belibus or Elibus, 702; the second son of Sennacherib was viceroy in 699, his name was Assurnadin, according to HINCKS, who (*LITERARY GAZETTE Journal*, April 1854) considers that he was Apranadius or Apronadius, 699; Rigebeclus, 693; Mesesimordacus or Mosesimordacus, 692; an interregnum, 688; Esarhaddon again as king of Assyria, 680; Saosduchinus or Sogdochenus, 667, who, with Chyniladanus or Kiniladanus, 647, perhaps ruled in Assyria; Nabopolassar or Nabubinyuchur, 625, who became king of Assyria on its conquest by him and Cyaxares the Median, but at all events rendered Babylonia completely independent of the Assyrians and Medes; his son Nabokolassar, Nabukudurriyuchur, Nabukudurussur, Bochtanser, or Nebuchadnezzar, 604, who married Amytis or Nitocris, the mother of Labynitus, and the daughter of Cyaxares; his son Illoarudamus, Abilberodan, or Evilmerodach of Scripture, 561; his brother-in-law Nerikassolassar, or Nergalsharezar, 559; his son Laborosarchod, 555; a revolution, ending in favour of Nabonadius, Nabbonad, Nabunahid, Nabunit or Labynitus, 555; and his son Belsharezar or Belshazzar, who appears to have reigned with his father when Babylon was taken, in 538, by Cyrus, who placed Darius, a Median, as viceroy in that capital until he himself ruled there in 532.

Tablets of Nabopolassar are found at Warka. Materials exist in the European museums for a full account of the domestic history of Nebuchadnezzar, whose name, with those of Nergalsharezar and Nabbonad one of the great restorers of previous works, are found at BABYLON.

The successors of Cyrus will be found under the article PERSIAN ARCHITECTURE: it is interesting to find that LAYARD, *Discoveries*, 8vo., London, 1853, observes that "it may be conjectured that in their general plan the Babylonian palaces and temples resembled those of Assyria." "One country appears to have borrowed from the other; and, without attempting to decide the question of priority of independent existence as a nation and of civilization, it can be admitted that they had to a certain extent a common origin, and that they maintained for

many centuries an intimate connexion." "It may have been a modification of the Assyrian art which afterwards gave birth to the Persian, for it was through Babylon that the arts appear to have penetrated partly, if not entirely, into Persia."

BACCARI (. . . .), was the architect engaged in 1746, in restoring and remodelling the church of S. Germain-l'Auxerrois at Paris. LEGRAND and LANDON, *Description de Paris*, 8vo., Paris, 1808.

BACCHA. The late Latin term for a beacon or light-house. 80.

BACCHUS. The performances, that were a portion of the festivals called Orgies, Bacchanalia, or Dionysia, celebrated in honour of this deity, the god of wine, took place in buildings thence called Dionysiac theatres. The principal seat of his worship seems to have been at Teos in Lydia. Of this edifice, (which was a hexastyle eustyle monopteral building by Hermogenes, according to VITRUVIUS, iii, 2, iv, 3, and preface to vii) the only remains are an architrave, and authority for the capitals and bases of the columns; DILETTANTI SOCIETY, *Ionian Antiquities*, fol., London, 1769, i, 8. A temple to Bacchus at Rome is mentioned by some writers, but it appears to be their misapprehension of the symbolic vine, as ornamentation, which has conferred a spurious antiquity upon the round church of Sta. Costanza, built close to the church of S. Agnese fuori le Mura. The vine, the ivy, the yew, the fir, and the fig-tree were sacred to him, and his statues are often recognizable by the thyrsus, the panther, and the slain goat.

BACCIO. The Tuscan common corruption of Bartolommeo. (GIULIANO and DOMENICO DI), see AGNOLO and BAGLIONI.

BACCIO DA MONTELUPO, see MONTELUPO (BACCIO DA).

BACCIO D'AGNOLO, see AGNOLO (BACCIO D') and BAGLIONI (BACCIO).

BACCIO BIGIO, see LIPPI (NANNI).

BACCIO DEL BIANCO, see BIANCO (BACCIO DEL).

BACE. This word is explained by WILLIS, *Nomenclature*, 4to., Cambridge, 1844, as the mediæval term for the pedestal of a statue in a niche.

BACERRA (GASPAR), see BECERRA.

BACHARACH (EWARD OF) renewed the *Thurm von gross Martin* at Cologne after the fire of 1378. 92.

BACK. This term is applied in many ways, as will be seen under the words CHIMNEY-BACK, SKEW-BACK, WINDOW-BACK, etc.; and under the following terms, in which it is chiefly opposed to the words breast, front, and edge. Besides being used through a false spelling for a cooler in a brewhouse (as the correct term is the German *bach*, Fr. *vase*, *vaisseau*) it has been inserted in the GLOSSARY as a term for the principal rafter of a roof; but it seems probable that this has been a mistake in some old writing for BALK. W. H.

BACK ARCH (Fr. *arrière voussure*). The term applied to an arch giving the interior of an opening a shape different from that which it has in front; a very usual mode of construction in mediæval works and the French architecture of the seventeenth and eighteenth centuries. 5.

BACK BASKET, sometimes BUCK BASKET. An old term for a basket for carrying materials (Fr. *hotte*, whence perhaps the English word *hod*). 5.

BACK BUILDINGS (Fr. *arrière corps*). The parts of an edifice which are recessed or stand back from the main or principal building. The term is also applied in England to those inferior offices of a building, which are usually placed in the rear of it.

BACK CHOIR (Fr. *arrière chœur*). A choir placed behind a high altar, as was usually the case in the churches of Capuchin monasteries. 5.

BACK DOOR (Sp. *puerta trasera*; Fr. *porte de derrière*). A door in the rear of a house.

BACKER. A narrow slate laid on the back of a broad square-headed slate, at the place where a course of slates begins to diminish.

BACK FILLING. The name given to the mass of materials used in filling up the space between two walls. w. r.

BACK FLAP. A leaf of a window-shutter hinged to the front shutter, and concealed when both are folded back into the boxing. **BACK SHUTTER.**

BACK FRONT (Fr. *face de derrière*). The rear elevation of a building.

BACK GROUND. A term used by artists, for the space behind the principal objects and middle distance of a picture, which has been adopted in architecture for the natural or artificial objects against which the principal portions of a building are seen.

BACK HOUSE (Fr. *corps de logis de derrière*). The building behind the chief part of a house, as at the sides or end of a court. 5.

BACKING. The internal mass of a wall, faced with more costly materials. The mass of material added on the haunches of an arch or vault.

BACKING OF A RAFTER OR RIB. The operation of making the upper or outer edge of a rafter or rib range with the general level of the other rafters or ribs on either side of it. The backing of the ribs of the cradling for a lathed and plastered ceiling, is the formation of the edges of the ribs on which the laths are to be nailed, and Gwilt, *Encyc.*, observes *s. v.* that the term is used "improperly, since contrary to the true meaning of the word"; but the force of this criticism is impugned by the general practice. **EDGING. FIRING. RANGING.**

BACKING OF A WALL. The name given to the mass of materials which is used in forming the inner face of a wall. 1.

BACKING UP. A term applied to any mass of materials, such as a wall bearing up against or confining a mass of earth.

BACK JOINT. A term applied by masons to a rebate such as that made on the inner side of the jamb of a chimney-piece to receive a slip.

BACK LINING OF A BOXING. The piece of framing, c, which faces the back of a shutter, s, when folded into its place or boxing.

BACK LINING OF A SASH FRAME. The piece of wood, e, on each side of a sash frame which faces the pulley piece, h, and stands next the jamb.

BACK LINING OF A WINDOW. The name given in some cases to the framing in the recess under a window, as at p. For the illustration to the above three articles, see **BACK SHUTTER.**

BACK NAILS. Nails made with flat shanks, so as to hold fast and not open the grain of the wood, used by carpenters in making wooden gutters, coolers, troughs, or other vessels for holding liquids. 4.

BACK OF A CHIMNEY OR GRATE. The hinder boundary parallel with the face of the opening. Some old mansions still preserve plates of cast iron, intended to reflect the heat of the fire and preserve the stonework of the back of the chimney. At the time when stove-grates were invented, this species of decoration (for the plates were sometimes ornamented with figures in relief) was placed higher up in the chimney, and is now sometimes used of highly enriched patterns, which are objectionable, as they injure the radiation, and cannot be kept clean without difficulty.

BACK OF A HANDRAIL. The upper side of a handrail. 1. 2.

BACK OF A HIP. The upper sides of a hip rafter. **HIP MOLD.** 1. 2.

The backs of a hip are those two superficies or planes at the outside of the hip, which, both in respect of their length and breadth, lay parallel with the superficies of the adjoining side and end of a roof. 13.

BACK OF AN ARCH. The upper surface of the voussoirs of an arch. 1. 2.

BACK OF A RAFTER. The upper side of a rafter placed in the sloping plane of the side of a roof. 1. 2.

BACK OF A RIB. This term commonly implies that side of a rib to which the lining or covering is to be attached; thus in

a coved wooden ceiling it might mean the upper side of the rib, and in a lathed and plastered ceiling it might mean the under side of the rib.

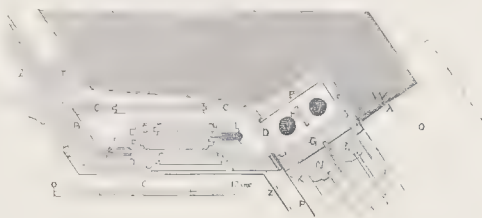
BACK OF A WALL. The inner face of a wall.

BACK OF A WINDOW, more commonly called **WINDOW BACK.**

BACK ROOM (Fr. *chambre de derrière*). An apartment looking out from the back of a building.

BACK SIDE. An old term still used in some counties of England for the yard or piece of ground behind a house.

BACK SHUTTER, or more usually **BACK FLAP.** The flap of a shutter which is so connected by hinges with a front shutter as to admit of being folded behind the principal one, and fall back with it into the box or recess which is now usually made for their reception: when thus folded back, the division which



is visible is called the front shutter, as q, and the flap behind it, as r and s, is termed the back shutter or back flap, which is generally made thinner than the front shutter, and framed with a bead and butt or bead flush panel.

BACK STAIRCASE (Fr. *escalier dérobé*). A staircase appropriated to the use of the domestics in a mansion or other habitation.

BACK YARD (It. *cortile di dietro*; Fr. *arrièrecour*, and *basse-cour*). The yard behind a house or other building. With regard to back yards or open spaces attached to dwelling houses, the Building Act 7 and 8 Victoria, cap. 84, schedule K, provides that "every house hereafter built or rebuilt must have an enclosed back yard or open space of at the least one square, exclusive of any building thereon, unless all the rooms of such house can be lighted or ventilated from the street, or from an area of the extent of at the least three-quarters of a square above the level of the second story, into which the owner of the house to be rebuilt is entitled to open windows for every room adjoining thereto. **AREA.**

BACON (CHARLES). A younger son of John Bacon, R.A., the eminent sculptor. He was a pupil of John Thomas Groves, with whom he remained some years after the expiration of his articles. His principal works are Woodford lodge, near Kettering, Northamptonshire, for the Right Hon. Charles Arbuthnot, M.P.; and Woodford church, Essex, rebuilt in 1816. On the decease of his father-in-law, Edward Crocker, in 1814, he obtained the appointment held by him under the Board of Works, of clerk of the works to the Westminster Department, which included the Parliament Houses and other public buildings at Westminster, the Treasury and other public offices at Whitehall, and likewise S. James's palace. He held the office of surveyor to the county of Middlesex at the time of his decease, 10th June 1818, in the thirty-fifth year of his age. G. B.

BADA (DON JOSEF), maestro mayor of the cathedral at Granada, obtained the same appointment at Malaga in 1719. The original design having been lost, he formed another to bring the work to a conclusion. The chapter however applied to other architects for the design of the façade, and having rejected that furnished by Ayala, chose that of Acero (attributed to Siloe), the execution of which was superintended by Bada until his death in 1756, after which it was finished by Ramos. 66.

BADAJOS (the Roman Pax Augusta). The chief city in the province of Estramadura in Spain. The streets, though very narrow, are regular and clean, and contain houses chiefly

three stories in height, with much handsome old ironwork in gates and balconies, and converge to the junction of the streamlet Rivillas with the river Guadiana, which is crossed by a bridge of granite, 1,874 feet long, and 23 feet wide, having twenty-eight arches, finished in 1596, and attributed to Herrera: the span of the largest arch is 73 feet, and of the smallest 21 feet. The cathedral, dedicated to S. Juan Bautista (commenced in 1248, and consecrated in 1284), consists of three aisles and twelve chapels; the eighty-five stalls, with as many statues, in the choir, were executed in 1557, and the sumptuous cloister in 1509. The front is of the Ionic order. The district churches are not important. Four convents and as many monasteries have been closed, leaving the same number of convents in existence; the suppressed establishments are used as follows: a barrack (S. Augustin's), the correctional tribunal (S. Domingo's), the state prison (Sta. Maria's, "in the castle", which was the original cathedral), and a parish church (S. Gabriel's); this last is circular, and of the Doric order, cleverly designed to suit the site, by Don Ventura Rodriguez in 1768, finished in 1790; the Observantine monastery of S. Francisco is in ruins. The *intendencia*, or governor's residence, contains the custom-house and other public offices. The *casa del ayuntamiento* was built in 1801. The remains of the Moorsque castle have been converted into three stories of cells for criminals. The large *seminario conciliar*, or college of S. Athon (1754); the magnificent hospital of N. S. de la Piedad (1773); the military hospital; the theatre; and the prison; are the only other public buildings of importance, although schools, barracks, hospitals, and a cemetery, are also objects of pride to the inhabitants.

W. H.

BADAJOS (JUAN DE). Born in the city of the same name, he was one of the nine architects who composed the celebrated *junta* that met at Salamanca, 3 September 1512, to decide upon the mode of commencing the cathedral in that city, as well as the site for the works designed by Juan Gil de Hontanon, whose plans were approved by Juan de Badajoz in 1513, he being then architect to the cathedral at Leon. He reported in 1513, with Juan Gil de Hontanon and Juan de Alava, upon the state of the works of the cathedral at Seville; and in 1515 he was commissioned, with Henriques Egas and Juan de Alava, by the chapter at Seville, to examine the works of the cupola of the cathedral. His name again appears, in 1523, as having been directed to report upon the condition of the works at Salamanca. In 1513, or a little later, he commenced the capilla mayor of the church of S. Isidoro at Leon, and was occupied in other works until 1537, when he designed and commenced the principal cloister of the Benedictine monastery of S. Zoil at Carrion de los Condes, in Old Castile: it was continued, under him and after his death, by Castillo and Celaya. In the same year Juan de Badajoz commenced the costly front of the royal convent of S. Marcos, belonging to the military order of Santiago at Leon; and in 1545 he designed and commenced the church and cloister of the Benedictine monastery or *collegio* at Exlonza near Leon, and he is supposed to have died before 1560, when Juan Lopez de Rojas is mentioned as directing those works. FORD gives 1514-1549 as the date of rebuilding the monastery at Leon, and, while admitting that Badajoz began the bottom range of the cloisters at Carrion, asserts that this artist only finished the eastern side.

66.

BADGIR, BAD GUYR or BAD GUIR. The name given by the Persians, according to CHARDIN, *Voyages*, 8vo., Paris, 1811, viii, 75, and CHESNEY, *Expedition*, 4to., Lond., 1850, ii, 625, to a means of ventilation used in every good house in the southern provinces of Persia, also in Caramania, and in Mesopotamia, which consists of a funnel or tube connecting the roof of a chamber with the open air, and resembles a chimney stalk, but is much larger and taller. It is in fact a square turret, having vertical apertures on the sides, and cross divisions in the interior. A similar funnel used in Egypt is there called *MUL'CKUF* (see Detached Essay VENTILATION, p. 8).

BADIGEON. A French name, adopted about two centuries since into the English language. Joiners, carpenters, and cabinet-makers, use the term for a mixture of sawdust and strong glue, for a mixture of putty and chalk, and* for a composition of whiting and glue, with any of which they filled up chaps, crevices, and other defects in wood. When the last of these is employed it is necessary to allow it to harden before planing the wood, as it shrinks considerably, being the same as the "compo" of picture-frame makers. Masons employ the term to pounded chippings of the stone they may be using, well sifted and ground into a composition with plaster and water, which they employ to make good defects in their material. Painters understand the term in its original sense of a yellowish coating for walls, consisting of the siftings of well-pounded chippings of any freestone mixed up in water or in size. In France more than in England it has been the custom to add ochre with it, in order to render it more yellow in colour: the French receipt for the most solid badigeon contains 24 pounds in weight of skimmed milk, 12 of lime, 12 of whiting (blanc d'Espagne) and ochre, and half a pound of common salt. This mixture is employed either to procure an uniform colour on stone, or to produce an imitation of stone work on plastered walls, the joints being drawn in colour upon it. 5. 40.

BAER (GEORGE), a Bohemian *baumeister*, began in 1569 the stone bridge near the Malmuehle at Saatz in Bohemia, and finished it in 1571. CZEKNY, *Excerpta historica*, ii, 16.

BAEZA (the Roman *BETIA*, *BECULA*). A city on the river Guadalquivir in Spain. It was the capital of the province of Jaen under the Arab domination, and it exhibits still many remains of Moorsque art in the public and private buildings. The streets, although tortuous, are well paved, and the three great *places* are very handsome. The Plaza de la Constitucion is planted with poplars, adorned by a caryatide fountain of several jets, and enclosed, on two of its sides, by houses with porticos. The bridge and the church of S. Andres date from between 1500 and 1525. The cathedral, dedicated to S. Francisco, is a Gothic building, which was modernized and received a façade of two stories, of Composite and Corinthian orders, in 1587. The *capilla mayor*, designed by Pedro de Valdelvira about 1540, was executed under his sons Francisco and Cristobal. The collegiate church of Sta. Maria del Alcazar and S. Andrés contains some fine tombs of the early Christian conquerors of the province. There are about twenty-four parish and conventual churches, half of which have been in great part destroyed. The monastery of S. Felipe Neri is alone remarkable; it contains the buildings formerly devoted to the university, but now to a *seminario conciliar* or theological college, with a splendid cloister two stories in height, in each of which there are respectively twenty-four marble columns of the Doric and Ionic orders, and a magnificent staircase, a theatre with enriched ceiling, and a chapel with Corinthian order on the exterior. The gates of Cordova and Ubeda, designed by Andrea de Valdelvira; the prison, by the same architect, and the triumphal arch, belong, with many other buildings, to the period of the *cinque cento* style, as displayed by the pupils of Berruguete.

W. H.

BAFFA, BAFFO, or BAFO, the modern name of NEW PAPHOS in Cyprus.

BAG. A measure formerly reckoned equal to a Winchester bushel, struck measure. Twenty-five bushels or bags make a hundred (or ton) of lime. The term, when applied to plaster of Paris, is reckoned at 14 lbs; eight bags are about equal to a bushel.

BAGACUM or BAGANUM, the ancient name of BAVAY in France.

BAGGIO (GIOVANNI DI) is mentioned under the date 27 June 1490, as one of the architects employed upon the works of the cathedral at Milan. FRANCHETTI, *Storia, etc., di Milano*, 4to., Milan, 1821.

BAGHDAD. A city in Asiatic Turkey, and the capital of a

pashalic of the same name. It is divided by the river Tigris, the original but smaller quarters being on the western bank, and forming suburbs to the town, which is on the eastern side. The Persians insist upon its existence as the representative of Seleucia, before the foundation by Al-Mansour, A.D. 762, of the present city, which was devastated by the Tatars in 1253, and ruined by the plague and inundation in 1831.

The present city is surrounded by a wall of brick and clay, with towers at regular intervals; a large enclosure situated on the east bank and serving as a citadel, contains the palace of the pasha, the arsenal, the mint, and public offices. The streets have, with few exceptions, the appearance of lanes running between high fence-walls, with small Moresque-looking doorways at some distance apart; and at intervals a ROSHAN or MESHREBEREYEH. The houses are built of brick, round courtyards, with porticos and verandas, the basement contains *serdab* or summer apartments, the ground floor the baths, store rooms, and servants' apartments; and the upper floor is occupied by the family and reception rooms, which, in the best houses, are lofty, and, besides rich wall decorations, have vaulted or groined ceilings, painted, gilded, and silvered. A few of these mansions, placed next to unsightly hovels, among palm groves, some mean mosques, six colleges, twenty-four baths, thirty caravanserais and bazaars (the principal one containing about twelve hundred shops), occupy half the modern city, the rest being chiefly covered by heaps of ruins: indeed there are scarcely any traces to be found in Baghdad of the magnificent "Medinet Assalam" or "abode of peace", of its palaces and gardens, its colleges and its hundred mosques. The town, however, contains some domes and minarets of unusual shape, decoration, and construction: the city gates; the college of the Caliph Mostanser, now a khan and the custom house; the tomb of Zobeide the consort of Haroun-al-Reshid; and numerous shrines and monuments to sheiks and imams in the neighbourhood are worthy of notice.

The only remnant of the Babylonian period hitherto discovered within the walls of the city, is a large drain or subterranean passage, built of large square bricks bearing the name of Nebuchadnezzar. At the distance of four or five miles is seen the ruinous yet lofty pile of sunburnt bricks called Akkerkoof. WELLSTED, *Travels to the City of the Caliphs*, 8vo., Lond., 1840; CHESNEY, *Expedition*, etc., 4to., Lond., 1850; LAYARD, *Further Discoveries*, etc., 8vo., Lond., 1853. w. h.

BAGLIONI (PIETRO), born 30 January, 1629, travelled in Italy, France, Flanders, Holland, Germany, and England, where he examined London and Oxford. He designed and executed at Perugia, the church of the oratory of the Padri Filippini; to this he joined their monastery, which he enlarged and modernized. In the same city he built the church of the Padri di S. Bernardo and, partly at his own expense, enlarged their monastery; and made alterations to his own house, in conjunction with that belonging to a nobleman; he also built a church at his villa of Particel di Campo, besides other churches and various buildings in the district of Perugia. He died 23 August 1705. 42.

BAGLIONI (BACCIO, GIULIANO, DOMENICO, etc.). This was the family name of Baccio d'AGNOLO, according to RONDINELLI, *Relazione della Città d'Arezzo*, 8vo., Arezzo, 1755, p. 84, who states that in 1554 the fittings in the choir of the cathedral at Arezzo were made of walnut wood by Giuliano Baglioni, the Florentine architect, etc., from the designs of VASARI, as that author "has written in the life of Baccio d'Agnolo, father of the said Giuliano".

BAGNACAVALLLO (the Roman TIBERTIACO). A city in the Papal States. It was formerly famous for its strong castle, and it is still a walled town, containing a cathedral dedicated to S. Michael the archangel, which, with a circus for the game of *pallone*, are now the only objects of architectural interest. 28.

BAGNARI (the Latin BALNEOREGIUM). A city in the province of Calabria Ultra in the kingdom of Naples, contains a

cathedral dedicated to S. Donatus the martyr, a parish church, four convents, a *seminario*, the remains of an ancient castle, of an aqueduct and of thermæ. LEAR, *Journals in Southern Calabria*, 8vo., London, 1852.

BAGOO, see PEGU.

BAGTCHESERAI, or BAKTCHISARAI. The capital of Crim Tartary since the year 1475. It is the only town in the Crimea which has preserved the architectural types of a Tatar origin. One entrance is through a triumphal arch, erected in honour of the visit of the empress Catharine II of Russia, and having only the figures 1787 as an inscription. The main street is about two miles in length; but besides thirty-two mosques, a synagogue, a Greek church, three medressch or colleges, and the numerous public and private fountains, there is nothing very remarkable in the buildings of the city generally, except the chimney tops, which are small perforated round turrets, with pointed tops. The palace however is generally described in the highest terms of admiration, especially by CASTELNAU, *Essai, etc., de la Nouvelle Russie*, 8vo., Paris, 1820, iii, 158, and by HOMMAIRE, *Réceries*, 12mo., Paris, 1846, p. 153, which accounts may be contrasted with that by CLARKE, *Travels*, 4to., Lond., 1810, i, 472. The entrance for strangers is in the middle of a suite of apartments, one story high; a long courtyard or *place d'armes* contains, on the right hand, the principal buildings and their dependencies, which divide it from a smaller court, having the offices on two sides, and at the end the harem with a curious octagonal tower or kiosk: the precincts of the palace include, on the left hand, a mosque with minarets; mausolea of the khans who reigned from 1654 to 1769; and at the bottom of the quadrangle the stables buildings. Except the harem, of which only one or two apartments remain as specimens of its former luxury, the whole of the palace has been restored by the architect, Mr. Elson, by order of the emperor Nicholas. Views of the *place d'armes*, etc., are given by DEMIDOFF, *Voyage*, fol., Paris, 1848, pl. 31, 37, and DUBOIS DE MONTPEREUX, *Voyage*, fol., Paris, 1839, pt. ii, pl. 63. From the palace an avenue of monuments, including the celebrated one of Maria Pototska, as it is called (DEMIDOFF, pl. 47), but really that of Dilarabekze (ob. 1764), the Georgian Christian wife of the last khan, Krim Ghérei, leads to the ancient cemetery of the sovereigns who ruled before Mengli Ghérei, 1478-1515, who was the founder of the palace. These tombs deserve comparison with the *turbels* of Cairo (*Illustrations*, pl. 62); one of them is also given by DUBOIS, iv, 29b; and there are three more, of later date and greater pretensions, one of which, near the mosque of Eskiour, is given by PALLAS, *Second Voyage*, Atlas, ii, 3.

BAGUETTE (from the late Latin word *baculetta*; It. *bacchetta*; Sp. *bagueta*; Germ. *stabecken*). A French word introduced into the English language, for a small molding, similar to, but less than, an astragal; called also a BEAD. The French architects employ the term for these moldings, except when placed on the shaft of a column, when they use the word *astragale*. It is also the old term in carpentry for a hip-roll, "astragal, or hip-molding on the hips or corners of a roof". 1. 19, 23.

ASTRAGAL. 1. 19, 23.

BAGYN (PIETER). The noble church at Haarlem, commenced in 1471, and finished in 1538, according to AMPZING, *Beschryfinge, etc. der Stad*, 4to., Haarlem, 1628, was built under the superintendence of several architects, but only the name of Bagyn is recorded, whence it may be supposed that the principal portion was executed under his directions. 24.

BAHIA, see S. SALVADOR DA BAHIA DE TODOS LOS SANTOS.

BAH-NAH-THOA. The name of a useful timber used in house and boat building, supposed to be of the genus *zizyphus*, is obtained from the woods of Tavoy, East Indies. 71.

BAÏE (the modern BAY). An ancient seaport of Campania, between Miscenum and Puteoli, on the western side of the Bay of Naples. On account of its warm baths and the beauty of its situation, it became a favourite place of resort amongst the

wealthy Romans during the latter part of the Republic. C. Marius, Lucullus, and Cæsar, all possessed villas there, and their example was followed by many of the luxurious patricians of that and the succeeding period, and by several of the emperors, the vast substructions and fragments of ancient buildings still visible testifying to the extent and magnificence of their palaces. These, owing to the subsidence of the land along this coast from volcanic causes, are now chiefly under water; the most conspicuous ruins above ground are the following, the whole of which are doubtless remains of the thermæ for which Baia was celebrated.

The first, formerly called the temple of Venus Genitrix, is now nearly destroyed; it was a domed apartment, circular, and about 60 feet diameter inside, with walls octagonal externally about 7 feet 6 ins. thick; it had eight large windows and four wide niches. Beneath are three chambers, of which one is square, another is partly square and partly oval in plan; they have vaulted ceilings, with bas-reliefs in caissons; these were in stucco, and represented chiefly obscene subjects which, with the remains of terra-cotta pipes, rooms for stoves, and reservoirs attached, sufficiently prove the nature of the edifice. The second (misnamed the temple of Mercury, or of Hercules, also called *Il Truglio*), about a hundred yards distant from the preceding, is also a circular chamber, but has an elliptical dome with a large circular eye at the top, and four windows in the drum; the inner diameter is about 66 feet 8 ins.; to this there are attached two quadrangular apartments. In the principal room a sound is conveyed round the wall as in the so-called whispering galleries of other edifices. The remains of channels for water which have been discovered in the foundations of this building render it probable that it was a FRIGIDARIUM. The third, called the temple of Diana, was perhaps a portion of the baths of Piso; it is octagon on the outside, with seven windows at top, and four large niches below; inside it is circular and about 96 feet in diameter; the vault has been destroyed, and in the thickness of the walls conduits for water are visible. There are also some chambers filled with rubbish.

The *BUILDER Journal*, vii, 218, mentions that one of these octagonal buildings is remarkable as offering probably the only ancient example of a BALCONY supported by small arches, on brackets or corbels.

These buildings are constructed with walls having brick quoins and courses filled in with reticulated work in tufo. The vaults are of tufo, solid, and thinner in substance as they ascend. The tufo has been corroded by the sea breeze; but the brick and cement have resisted it. Within the solid of the walls there are arches of construction, with voussoirs formed of large tiles, the wide intervals between which are filled with brickbats. Though the walls have been riven asunder, and in some places thrown down, by volcanic or some other powerful agency, the remains are hard and compact as rock, it being easier to fracture than to disunite the materials. Such is the present condition of Baie, to which there has been attached for a long time far more importance than is justified by the remains.

The modern Castello di Baja was erected in the time of the emperor Charles IV, previous to which period however Baie had been deserted by its inhabitants.

The village of Bacola or Baccolo, or rather Baoli, which stands on a ridge at some height above the sea, a little to the southward, represents the ancient Bauli, which was close to the sea-shore. The range of its villas probably adjoined those of Baie; as the two names were frequently used as synonymous by classic authors. Extensive ruins still exist, among which are the *Cento Camerelle*, formerly called the prisons of Nero, a vast subterranean building consisting of a number of vaulted chambers. And on the summit of the hill is an immense vaulted subterranean construction, which is called the *Piscina Mirabile*, 220 feet long by 80 feet wide, in which forty-eight piers in four rows support the vaulted roof. This was doubtless used as a reservoir.

In the neighbourhood are remains called the tomb of Agrippina, now more generally considered, from their arrangement and character, to be the ruins of a small theatre, probably an odeum belonging to the villa of Hortensius. A semicircular corridor with a vaulted roof, and the remains of steps and the supports to the seats, are still to be seen. The ceiling was formerly covered with stucco bas-reliefs and the walls with fragments of paintings, which have now wholly disappeared. SARNELLI, *Guida*, 12mo., Naples, 1697; PAOLI, *Antichità di Pozzuoli*, fol., Rome, 1768; ROMANELLI, *Viaggio a Pompei*, 12mo., Naples, 1817, ii, 176; and the same author, *Antica Top. Ist.*, 4to., Naples, 1819, iii, 510.

BAILEY, or BAYLEY. A corruption of the late Latin word *ballium*, said to be derived from *battaglia*, as indicating the place where the attack of a town generally commenced, and afterwards the external walls of a fortress, whence it was applied to the area which they enclosed. Thus there might be not only an inner and an outer bailey, as at Oxford, Bedford, and Colchester Castles, and the Tower of London, but even a third or a fourth subdivision of the whole area. The donjon or keep was generally at one corner of the area, and the inner bailey usually contained the barracks, hospital, artificers' dwellings, stables, etc., and sometimes even a monastery. Large mounds were also often thrown up in this place; these served, like cavaliers in modern fortification, to command the surrounding country. 19. 23.

The word has been retained in many parts of England, for its connexion with the donjon used as a prison is clear. GROSE, *Antiq.*, 4to., London, 1773, preface 6, observes that in towns the appellation of ballium was given to a work fenced with palisades, and sometimes masonry, covering the suburbs, but in castles was the space immediately within the outer wall. "The wall of the ballium in castles was commonly high, flanked with towers, and had a parapet, embattled, crenellated, or garretted: for the mounting of it there were flights of steps at convenient distances; and the parapet often had the merlons pierced with long chinks, ending in round holes, called oilets." BARBICAN. BRAY.

BAILLIE'S VENTILATOR. An apparatus formed of narrow plates of glass fixed like louver-board in a frame, and combined with a movable plate as a cover or valve, which was patented 25 November 1844, by Mr. Benjamin Baillie. CIVIL ENGINEER, etc., *Journal*, viii, 224; *BUILDER Journal*, iii, 319. MOORE'S PATENT LEVER VENTILATOR.

BAIRAM KALESSI in Asia Minor, see ASSOS.

BAINET (JUAN) constructed part of the *collegio de Corpus Christi* at Valencia, namely, the great doorway of the library, and the vestibule from thence to the head of the staircase, about the year 1586. 66.

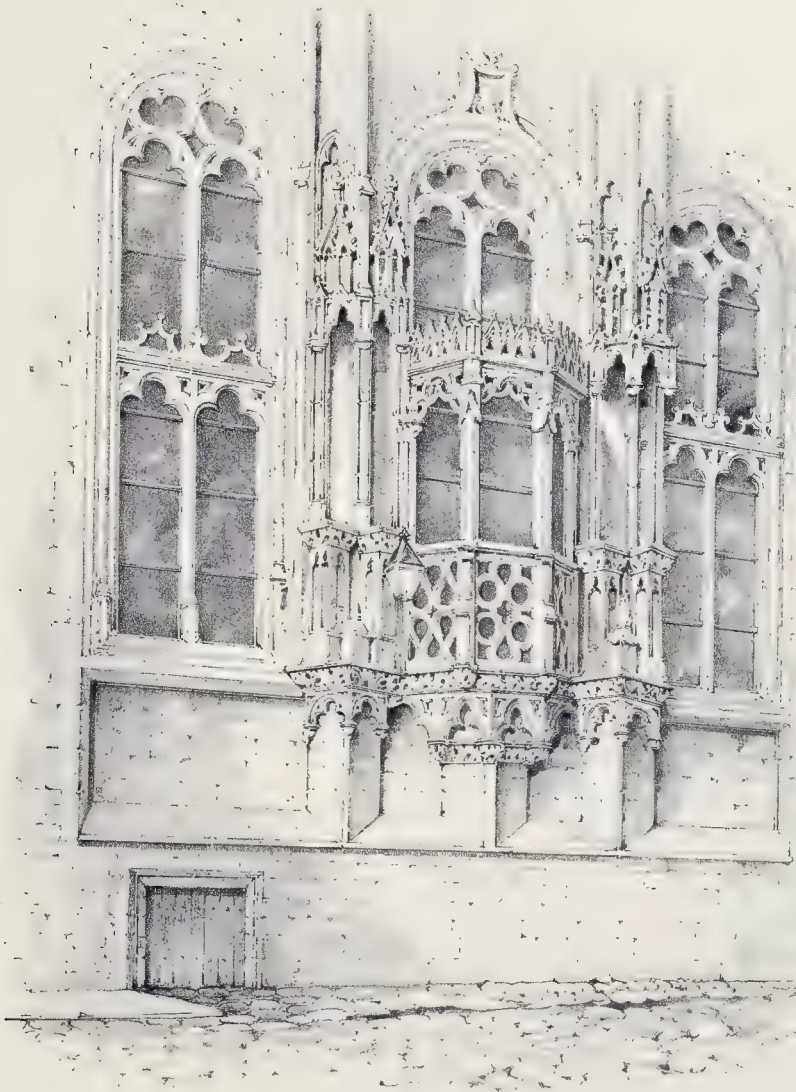
BAIZE DOOR, see COVERED DOOR.

BAKER (HENRY AARON), born in Ireland in 1753, was a pupil of James Gandon, and acted as clerk of the works to the buildings designed and chiefly constructed by his master for the Inns of Court, then called the King's Inns, at Dublin, of which the first stone was laid 1 Aug. 1800. Gandon, in his letter to Lord Chancellor Redesdale conveying his resignation of the post of architect to that edifice, states that "Mr. Baker is in possession of all my drawings for this building to assist him, and his abilities are fully equal to the undertaking." He was a member of the Royal Hibernian Academy, and for some time its honorary secretary. He erected the triumphal arch called Bishop's Gate at Derry (1789 or 1803 to 1808), and obtained (1802-4) the first prize for designs for adapting the Parliament House to the offices of the Bank of Ireland, although the superintendence of the works was not given to him, but to Francis Johnstone. He died June 7th, 1836, and was buried in the churchyard of S. Thomas in Dublin. DUHIGG, *History of the King's Inns*, 8vo., Dublin, 1806, p. 518; MULVANY, *Life of J. Gandon*, 8vo., Dublin, 1846.

BAKERY. A place containing kneading troughs and an









oven for the purpose of baking bread, which is as essential an appendage to a great mansion in the present day as the *furum* or bakehouse was a necessary portion of the conveniences of a Roman farm, and in later times of a monastic establishment. A complete baker's establishment has been discovered at Pompeii, in the building known as the House of Pansa; it consists of shops B and F, store rooms B, repositories for wood and charcoal D D, and a bakehouse A. In the centre of the latter are three mills, and near them a large table; flanking the entrance to the oven, C, are vases, and in the left hand corner is a kneading trough, with two copers placed over furnaces.



Tenants throughout England were formerly obliged to bake at the oven of the lord of the manor, and to have their corn ground at his mill. The fee of such a relic of feudalism at Daventry was purchased in 1786, and has since been again sold. BAKER, *History, etc.*, of Northampton, fol., London, 1830, i, 308. A small room with an oven in it was discovered upon taking down the side aisles of the church at Crickhowell in Breconshire. If more such instances were discovered, they might be accounted for by a passage in the *Capitula* of Theodulf, about A.D. 994, ordering that the bread for the sacrament should be baked in the presence of the clergyman. JONES, *History of Brecknockshire*, 4to., London, 1809, ii, 432.

The presumed defects of the well arranged government establishments at Plymouth, Portsmouth, and Deptford, are detailed, p. 257, by ROLLET, *Memoire sur la Meunerie*, etc., Paris, 1847, who gives, pl. 36, a plan of the granary, mill, and bakery at Portsmouth; these suggestions only relate to the machinery, with a hint as to the employment of larger granaries, which is advocated throughout his work.

BAK'TCHISARAI, or BAKTSHE-SERAI, the ancient capital of the Crimea, see BAGHTCHESERAI.

BALACH, BALOH, BALAH BUNGAH, and BALOH BUNGAH, are the native names of woods used for furniture, obtained from Prince of Wales's Island. 71.

BALAESTRA (. . . .) was one of the artists who accompanied Sir W. Hamilton from 1799 till 1802, through Greece, Asia Minor, and Egypt, and supplied the materials for the architectural department of the account of that tour. He was afterwards employed to erect the hotel of the English embassy at Constantinople. 68.

BALAGNE or BALANJE. A place in Nubia, containing a rock-cut monument, consisting of a porch; a hall with four columns (which are unique in respect to other Nubian sacred monuments) having a chamber on the right and left; and a third room, which might be taken for an adytum, were there not a chamber formed beneath it. GAT, *Antiquités*, fol., Paris, 1823, pl. 62, does not give any indication of its age, nor a sufficient section of the adytum. The columns, with their caps and bases, are so plain as to warrant the belief of their being of great antiquity. RAMÉE, *Hist.*, 12mo., Paris, 1843, i, 203.

BALAGUER (PEDRO) is mentioned under the date of the 18 May 1414, as having been the "*arquitecto perito*" engaged by the Board of Works of the cathedral church at Valencia to see and examine the towers and belfries at Lerida, Narbonne, and other cities, and to take from them whatever was hand-somest and fittest in order to finish that called the Micalote or Migulete, commenced in 1381 by the Board at Valencia. 66.

BALANCE GATE. A gate which works upon a vertical centre. 23.

BALANEIUM, or Βαλανεῖον. A Greek term for a BATH. 7.

BALATORIUM, see BALLATORIUM.

BALBACANA, wrongly written for BARBACANA.

BALBASTRO in Spain, see BARBASTRO.

BALBECK, now written BAALBEC.

BALBI (. . . .) designed, in 1597, and commenced the

erection of the church of the Madonna della Ghiara at Reggio, which was completed by Pacchione. 28.

BALCONY (It. *balcone*; Sp. and Fr. *balcon*; Ger. *bal-kone*). A projection from the wall of a house, either externally or internally, protected by a balustrade or railing, and forming a floor on which one or more persons may stand, and connected with, but separated from, the general floor at that level of the building. If the passage of PLINY, *Hist. Nat.*, xxxvi, 18, with regard to Sostratus, "*hic idem architectus primus omnium pensilem ambulationem Gnidi fuisse traditur*", be not received as an account of the first balconies, recourse must be had to a correction of QUATREMÈRE DE QUINCY, *Dict. s. v.*, who, to prove that the ancients could have had no balconies, as their windows were as high as possible from the floor, adduces the story related by the PSEUDO-ASCONIUS in his notes upon CICERO, in *Cæcil.*, 8vo., Tig., 1826, that when Mænius sold his house in the forum to M. Porcius Cato, censor B.C. 184, as a site for the Porcian basilica, he reserved to himself the right of property in one of the new colonnades, "*super quam tectum projiceret ex provolantibus tabulatis*", whence he might witness the games. This might have been merely a temporary wooden shelter, but QUATREMÈRE seems to imply that a balcony, called after him *mænianum*, was set up; whereas FESTUS and ISIDORUS clearly observe that *mæniaria* (edificia being understood) were named from C. Mænius Antiatius, who when censor B.C. 318, allowed balconies to be added to the various buildings surrounding the forum, so as to afford the spectators better opportunities to see the games. This leads to the inference that the Pseudo-Asconius had absurdly confused the permission to erect balconies with that for a *columna mænia* carrying an equestrian statue, and placed in the forum at Rome to the honour of the C. Mænius Antiatius above named, about the year B.C. 338, according to LIVY, viii, 13; PLINY, *Hist. Nat.*, xxxiv, 5. QUATREMÈRE, however, prudently restricts his explanation to the open and balustraded porticos which the Italians call *loggias*; yet properly observes that WINKELMANN notices the fact of some antique private houses having had a projecting floor answering to the English and French idea of a balcony, such as the Italians call *ringhiera*, which is a balcony on the first floor of a *broletto* or town hall, from which the magistrates addressed the community assembled "*in parlamento*"; such balconies exist at Milan and were formerly to be seen in almost every Lombard city: the word *mignano* is mentioned by QUATREMÈRE as the Italian term for a sort of glazed verandah, consisting of a balcony, sash, and awning. In 1107 the *podestà* of Pistoia was to destroy all balconies pointed out by the consuls in that city. MURATORI, *Antiq. Ital.*, iv, 543.

A writer in the *BUILDER Journal*, vii, 218, observes that one of the octagonal temples at Baie is remarkable for offering perhaps the only ancient example of a balcony, supported by small arches, springing from brackets or corbels. These project from large openings, one on each side of the octagon. They are doubtless the prototypes of the arched balcony now so common in southern Italy. GRUNDA, *STETHÆUM. STEGE. PROPHYRUM. EXOSTAS. PROTECTUM. EKTHETES. HELIASTERIUM. SOLARIUM. PULVINAR.*

The use of balconies in internal decoration, may be traced from galleries and false landings on staircases through the corbelled pulpits of Romanesque art, almost up to the ambo of the early Christian churches; while there are hardly sufficient remains of so remote a date for examples of external works of the same character. That the invention of these last was also due to the Gothic architects can hardly be disputed by those who, remembering the fine examples at Nancy, dating from 1502, and given by SOMMERARD, *Album*, iv, pl. 8; those at Florence on the Loggia dei Lanzi and the Palazzo Vecchio, given in the same work, x, 4; those placed at the corners of buildings in Italy, such for instance as the celebrated circular pulpit, or rather gallery, by Donatello, on one corner of the front of the cathedral church at Prato; and the oriel and bay windows of

Pointed architecture, can thus trace the progress of the balcony until it became a valuable, and at length an important, feature in modern classic architecture.

1. 14. 25.

CHAMBERS, *Dict.*, fol., London, 1786, s. v., says, "where there is but one, it is usually in middle of the front of the edifice, and level with the first floor: sometimes they are made of wood, sometimes of cast iron; the former surrounded with a rail, or balustrade, the latter wrought in various figures in *demi-rilievo*. Some are also made of bar iron, fashioned in crail work, or flourishes of divers fancies."

In modern use either a single or a continuous balcony is introduced externally before windows, in order to gain a better view and a means of escape from fire; and sometimes it is accompanied by an AWNING, thus forming a VERANDAH: the balcony is frequently enlarged to the dimensions of the porch or portico which it may appear desirable to cover, the pillars or piers of which support its floor. Some balconies have but a slight projection before the wall, and several French examples are contrived in the actual thickness of the wall; but generally they rest upon corbels, brackets, or cantilevers, although some are yet placed on columns or pillars, in the manner which prevailed during and after the sixteenth century, some of the earliest specimens of which are seen in the old inns in England. When a balcony is placed before a window, the sills of the windows are often raised but very little above the floor of the balcony and the room to which it belongs. At the end of the eighteenth century balconies in London were frequently made with railings convex in plan to the street or road, but earlier examples show plans of almost every possible outline.

QUATREMÈRE DE QUINCY observes that the difference between a *balcon* and a *balustrade*, consists in the one being made of metal, and the other of masonry.

W. H.

The word balcony is apparently derived from the Italian term *paleo*, the floor or stage of a scaffold, and thence of a theatre: *balco*, in mediæval Latin termed *balcon* and *balconus*, is used in the same language and sense, from which are derived *balchionata* and *balconata*, translated a small railed gallery. ACHARISIUS observes that some writers give a Venetian, but others a Genoese origin to the word. *Balcon* is used by the French architects for a row of seats projecting before the tier of boxes immediately above the pit of a theatre, according to GWILT, *Dict.* s. v.; but according to VIRLOYS as well as GLAIRE and WALSH, *Dicts.* s. v., it is used for the boxes placed upon the *avant scène* or proscenium.

BALDACHIN (It. *baldachino*; Fr. *baldachin*; Sp. *baldachino*; Ger. *baldachin*). The derivation of this word has been a source of argument for antiquaries; the most direct is Baldachinus, the name given to the prince of Damascus who was conquered in 1130 by the Crusaders; while according to another opinion the word contains the name of a city, Baldach, which is not easily found in mediæval geography unless Bagdad be meant. The authority of ADELUNG however, putting aside any German compounds like *boll-decke* or *pali-dach*, and comparing the words *baldicium*, *baldicuarus*, *baldinella*, and *baldanum* (Baldano was an infamous quarter of Florence), would lead to the conclusion that the root of the word contained in the first portion of the term must be sought in some Eastern synonym for silk embroidered in gold. A coin passing for six deniers, which was prohibited circulation in France in 1282 and 1308, was called a *baudekyn*. The word, generally written by the earlier English authors "*baudkyn*", was the name (borrowed from the old term for the richest kind of tissue of golden threads), for a CANOPY, PAIS, imperial, or tester, which, as a mark of honour, was carried over personages of distinction, or fixed over things considered sacred. The canopy borne over the sovereigns of England by the barons of the Cinque Ports is an example of the simple form of the baldachin, which in general may be described as a cloth stretched horizontally and supported by upright poles, with a hanging fringe or valance, but destitute of curtains, which properly belong to the CIBORIUM

according to the *Encyc. Methodique*. The name is also applied to the canopy borne over the Eucharist, as well as over the pope in procession on days of ceremony, which is not unfrequently like an umbrella or parasol, either of domical or tent-like shapes, as used by Raffaello amongst his decorations of the loggie in the Vatican (forcibly recalling the oriental signs of authority). MILLINGEN shows a similar sort of parasol from an Etruscan vase.

W. H.

The first change made in principle, if not in time, from the ancient to the modern CIBORIUM, seems to have been the baldachin, as seen in the church of Sta. Maria Maggiore at Rome, where it appears in the form of a crown, supported by four angels standing over porphyry columns, and surmounting the high altar. This is however superseded by the well known work



executed in 1633 by Bernini, in the cathedral church of S. Peter in the same city, which consists of a black marble pedestal about 12 feet high, supporting four bronze twisted columns, 30 feet in height, partly fluted and partly ornamented with foliage; an entablature 12 feet high belonging to the order, which is composite; and of a scroll-work covering 40 feet high, supporting a cross 13 feet in addition.

The Pantheon was despoiled of its bronze to furnish the material for this work, and for the angels which are placed over the columns; but only 186,392 pounds in weight were used, the remainder serving as materials for cannon.

In this and in numerous other variations from the original type, an imitation of the scalloped or other fringe of a portable canopy is fixed below the architrave; and above the entablature the tent-like form of the covering recalls the employment of curtains and other tapestry with the older ciborium or UMBRACULUM: but frequent imitation having brought a desire for novelty, the churches of the Roman Catholic faith have been disfigured during the last hundred and fifty years by baldachins presenting compositions, scarcely deserving to be called architectural but rather owing their combinations, of palm-trees and other foliage with ornament of the most degraded styles, to the fancy of the upholsterer and the scene-painter. The baldachin in the church of S. Sulpice at Paris was formerly, if it is not at present, suspended from the ceiling. In the revulsion of feeling the baldachin has become somewhat similar to the *ÆDICULA* of the ancients. ALTAR. It has been well remarked that the idea of the baldachin was retained in mediæval art, in the coverings over the tombs of distinguished personages as in the instances in Westminster abbey church, as well as in the single or continuous canopies of niches and altar-screens. SOMMERARD, *Album*, fol., Paris, 1848, i, pl. 14; ii, 30; v, 6, 31; *Atlas*, xi, 2, 3, 4, 5.

1. 25.

The term Baldachin was also formerly applied to the shell or other similar canopy placed during the first half of the eighteenth century over the front doors of houses in England.

4.

BALDASSARE DI SIENA, or SANESE, or BALTHASAR SENENSIS, see PERUZZI (BALDASSARE).

BALDASSARE SANESE (GIOVANNI DI), see PERUZZI (GIOVANNI DI).

BALDUCCIO (GIOVANNI) of Pisa, flourished in the middle of the fourteenth century according to CIOGNARA, *Storia della Scultura*, fol., Venice, 1813, i, 219, 367-458, who gives an inscription, dated 1347, and ending with the words "*magister Johannes Balducci de Pisis edificavit hanc portam*," from the front of the church Di Brera at Milan.

BALDUIN, BALDWIN, or BALDWYN, abbot of Bury S. Edmund's in Suffolk, 1065-1097, erected in that town the abbey church, of which now but few vestiges exist.

BALDWIN (ARCHBISHOP), see CANTERBURY (BALDWIN OF).

BALDWIN (THOMAS), of Bath, was appointed city architect about 1775, on the death of Thomas Warr Attwood, and resigned the office about 1800. He was succeeded by John Pal-

mer. Baldwin's extensive plans for building in Bathwick meadows several new streets, a square, a circus, and a crescent, though partly commenced were relinquished in consequence of the unfavourable circumstances of the times. The building of the Guild or Town Hall, though begun 11th Feb., 1768 (not 1766 as quoted by WARNER, *History*, etc.), was afterwards stopped, and not continued until 1775, when Baldwin completed them (in 1777) on an improved plan. He designed the Cross baths about 1790; the portico to the Great Pump Room in 1786, the western front in 1791, and rebuilt the Pump Room in 1796; Laura Chapel, Henrietta-street, in 1796; and the private baths and appropriate rooms in Stall-street, adjoining the king's bath, in 1788. Some of these buildings will be found well illustrated in NATTE's *Views in Bath*, fol., Lond., 1806. He filled the office of chamberlain some time before 1796. He had drawings made of the antiquities discovered in 1790, near the king's bath, which though prepared for engraving, do not appear to have been published. The fragments were however illustrated, etc. by ENGLEFIELD in vol. x of the *Archæologia*, in 1791; by POWNALL in 1795; and by LYSONS in 1802. He died 7th March 1820, aged 70.

J. W.

BÂLE, the French way of writing BASLE.

BALECTION, BELECTION, BILECTION, BOLECTION, or BOLEXION, a term applied to moldings which project before the face of the work which they decorate.



BALEINE. The name, obtained from the French, which is given to a stage supported from the ground and carrying a temporary railway; it is chiefly composed of two trussed beams lying side by side, on which, where embankments from 7 to 30 feet in height are being formed, the ballast waggons are run, and are tipped so as to shoot their contents between the rails of the baleine. Descriptions of two sorts are given by BRES, *Illus.*, 8vo., London, 1853.

BALINEÆ, or BALINEUM, see BALNEA.

BALISTA. The name given in old books to the geometrical cross-staff, which is also called a Jacob's staff, used in surveying.

13.

BALISTARIA or BALISTRARIA. The room in which the arbalests, *balistæ*, of a mediæval fortress were kept. The word is also used for ARBALESTRIA or LOOPHOLE.

17.

BALK, BAULK, or BAWK. This word is used popularly in three senses, of which the oldest appears to be, a ridge or bank between two furrows, and also between two pieces of arable land. It is applied by engineers to the ridge between any two excavations.

The next meaning, that given by JOHNSON, *Farmer's Cycl.*, 8vo., Lond., 1842, of "the great beam or dormer of a house," is derived from the German term *balken*, a beam generally, and also a rafter, thus *balken-verke* means beams and rafters. The same authority uses the term for "the frame-posts on which corn stacks are placed." CHAMBERS, *Dict.*, s. v., fol., Lond., 1786, states that "in some parts of England, balk or bawk denotes the summer beam of a building; balks or bawks also denote poles laid over a stable or other building for the roof."

The same author gives as the third meaning, "a sort of beams imported, from five to twelve inches square; the greater balks are accounted timber if above eight inches square"; and NEVE, *Dict.*, 12mo., Lond., 1736, says that balks are "small fir trees without tops, brought from Norway," whence balk timber was sometimes called Dram timber. It consisted of pieces of whole fir from 18 to 25 feet long, tapering considerably, being the trees roughly squared as the trunk was felled, and therefore not only the thickness varied, according to the tapering of the tree, as it was left by the adze, but the sides were not of necessity at right angles with each other, or even parallel. NEVE also observes that larger pieces of the same sort of timber were called

ARCH. PUB. SOC.

LOAD BALKS. The word is also used for pieces of timber employed in making a FRENCH SCAFFOLD.

W. H.

The term is defined by BRES, *Glossary*, s. v., as "bulk, log, or whole timber, the name given to timber of 13 inches scantling, half timber is 6½ inches square."

BALK ROOFING. An old term for roofing in which the framing was constructed of what was then called Balk timber.

BALK STONE. A provincial name given to an impure stratified limestone.

70.

BALL, see BALLON.

BALL AND SOCKET JOINT. A globe of metal either hollow or solid, as the case may require, fitted within a hemispherical partial covering, so that a rod or pipe attached to the ball may swing freely in any direction; it is a very useful adjunct in gas fitting.

13.

BALLARINI (GIAMBATTISTA) designed, a little before the year 1766, the buildings of the fraternity of the Trinity and the church of S. Benedetto at Bologna.

94.

BALLAST. The term applied to unscreened stony gravel when mixed with lime for concrete; or to the broken stones and other material used for the same purpose when clean sharp sand is provided.

BALLASTEROS (AUGUSTIN or VALENTIN DE) succeeded Gaspar Ordoñez, in 1608, in the execution of the works of the church of the Jesuits at Alcalá de Henares in Spain.

66.

BALLASTING or BOTTOMING, more properly METALLING.

BALL-COCK, BALL-TAP, etc. A tap applied to the supply-pipe of a cistern, having a hollow air-tight globe or ball, generally made of some metal, as copper, connected with it by a round or square lever or arm. As the water flows in, the ball floating thereon rises, and finally closes the tap when the cistern is full. A glass float has lately been introduced to supersede the metal ball. The above arrangement of parts is frequently found to be insufficient, either from the rod which forms the lever not being sufficiently stout, or from the cock getting too stiff.

Several varieties of taps have been suggested, amongst which are FAREY'S DOUBLE BALL COCK; JENNINGS'S INDIAN-RUBBER VALVE AND BALL COCK; LAMBERT'S EQUILIBRIUM BALL VALVE; MURRAY'S COMPENSATING BALL LEVER; TYLOR AND SONS' PATENT HIGH PRESSURE BALL VALVE; UNDERHAY'S BALL VALVES FOR HIGH PRESSURE; WARNER'S VALVE; ABRAHAM'S NEW WATER COCK is illustrated in CIVIL ENGINEER, etc. *Journal*, vol. i, p. 381.

23.

BALLESO (GIOVANNI) is written by MILIZIA for VALLEJO (JUAN DE).

BALL FLOWER. The name recently given to a round flower which has three or four leaves opening just sufficiently to show a ball within them, and forming an ornament which

though sometimes seen, as on the west front of the cathedral at Salisbury, in buildings erected towards the end of the style called the Early English period of Gothic architecture, is generally characteristic of the Decorated Gothic style of the fourteenth century; as in the church of Grantham, Lincolnshire; and in the cathedrals of Gloucester and Hereford, in the last of which it is everywhere introduced: it is found repeated at regular intervals, inserted in a hollow molding. The same sort of flower, but with four petals, is sometimes seen singly in buildings of the latest Norman period. The flower is sometimes found, as at Oxford cathedral, with its lobes slightly flattened on their sides. The GLOSSARY observes that "this ornament appears to deserve rather the name of Hawk's Bell, to which it bears considerable resem-



Window from BALLFORTH church, Gloucestershire, given by BRANDON, *Analogue*.
a, Bloxham church, Oxfordshire; b, d, York cathedral;
c, St. Alban's abbey, Hertfordshire.

blance." These ornaments, called *roses* or *rosaces*, are placed by the French archaeologists amongst the distinguishing ornaments of the thirteenth century.

17.

BALLIUM. The late Latin term for BAILEY.

BALL LEVER. A lever of metal having a ball affixed at one end as a weight, which assists in closing again the plug or valve of a cistern after it has been pulled up to obtain a supply of water. It is most commonly applied to cisterns of water-closets. A is the lever, B the cistern, C the wire from closet, D the wire to lift plug or valve.



BALLON or **BALLOON.** A large ball, globe, or sphere, placed above a column or pier as an ornamental termination. The same name is sometimes given to the globe under the cross on the top of a church; that of S. Peter at Rome has a sphere 8 feet in diameter, which is commonly called the "ball".

1.

BALL ROOM, see **ASSEMBLY ROOM.**

BALL VALVE. A ball made truly spherical so as to fit water-tight into the valve-seat in every position. The ball is prevented from wandering by being confined in a chamber. Taps with ball and valve applied to the supply-pipe of cisterns instead of BALL COCKS are often called ball valves. JENNINGS'S

23.

BALNEA. A Latin word used in the singular number in an inscription given by REINSESIUS, xi, 115, for a private bath. In the plural it was used equally with *balinea* for a set of rooms belonging to the bath of a private person.

BALNEÆ, like *balinea*, was the Latin term for the public baths among the prose writers, but the poets chiefly used *balnea* in the plural number. *Balnea pensilia* is the expression of VALERIUS MAXIMUS, ix, 1, and *balinea pensiles* that of PLINY, *Hist. Nat.*, ix, 54, for those vapour and other chambers in the baths which had the floors suspended over the hypocaust.

BALNEARIUM was the Latin term for a chamber containing a private bath; *balneolum* being a diminutive of this word; *balnearia* therefore meant a private range of bath rooms.

BALNEUM or **BALINEUM** was the Latin term for a bath or bathing vessel itself, and afterwards was applied to a private bathing chamber; but it must be stated that PLINY and later writers use *balneum* as a private bath, and *balnea* in the neuter plural as public baths, and call the public baths indifferently *balnea* and *thermae*.

BALSAM. The name given to the *Picea balsamea*, a timber tree of Canada. LAC. VARNISH.

71.

BALTARD (LOUIS), a painter as well as an architect, was born at Paris 9 July 1764, became a government architect, Professor in the Académie des Beaux Arts in that city, membre honoraire du conseil des bâtiments civils au ministère de l'intérieur et du conseil des travaux publics de la ville de Paris, etc., and died in 1845, Président honoraire de la Société Académique d'Architecture, at Lyon.

He assisted in the publication of the third and fourth parts of the "*Grands Prix d'Architecture*" by VAUDOYER, and published the following, among other scientific and literary works: *Paris et ses Monuments, avec des notes hist. et crit.*, par Amaury-Duval, fol., Paris, 1803, etc., consisting of 100 very fine plates of the Louvre and part of the chateau of S. Cloud, the chateau of Ecouen and that of Fontainebleau, measured, drawn, and engraved by himself, as was the next work, *La Colonne de la Place Vendôme, contenant les détails des bas reliefs*, in 145 plates, fol., Paris, 1810.

In 1814 he exhibited drawings of the choir of the church of Ste. Geneviève; then published *Essai méthodique sur la Décoration des Edifices et des Monuments, ou Collection et Choix des plus beaux morceaux de Sculpture et Peinture ancienne et moderne*, fol., Paris, 1817, with 120 plates.

In 1819 some designs for fountains in the Champs Elysées

were exhibited by him; these were either commissioned or purchased by the préfet of the department of the Seine; he published and privately circulated in 1825 *Prison en remplacement de celle de S. Joseph*, 8vo., Lyon, in sequence to which he produced the works called *Architectonographie des Prisons; ou parallèle des divers systèmes de distributions dont les Prisons sont susceptibles, selon le nombre et la nature de leur population, l'étendue et la forme des terrains*, with 40 plates; and *Projets du Palais de Justice de la ville de Lyon*, 4to., Paris, 1830.

The *Eloge Historique de Louis Baltard, Architecte*, 8vo., Lyon, 1846, by J. M. DALGABIO, could not be procured for this article.

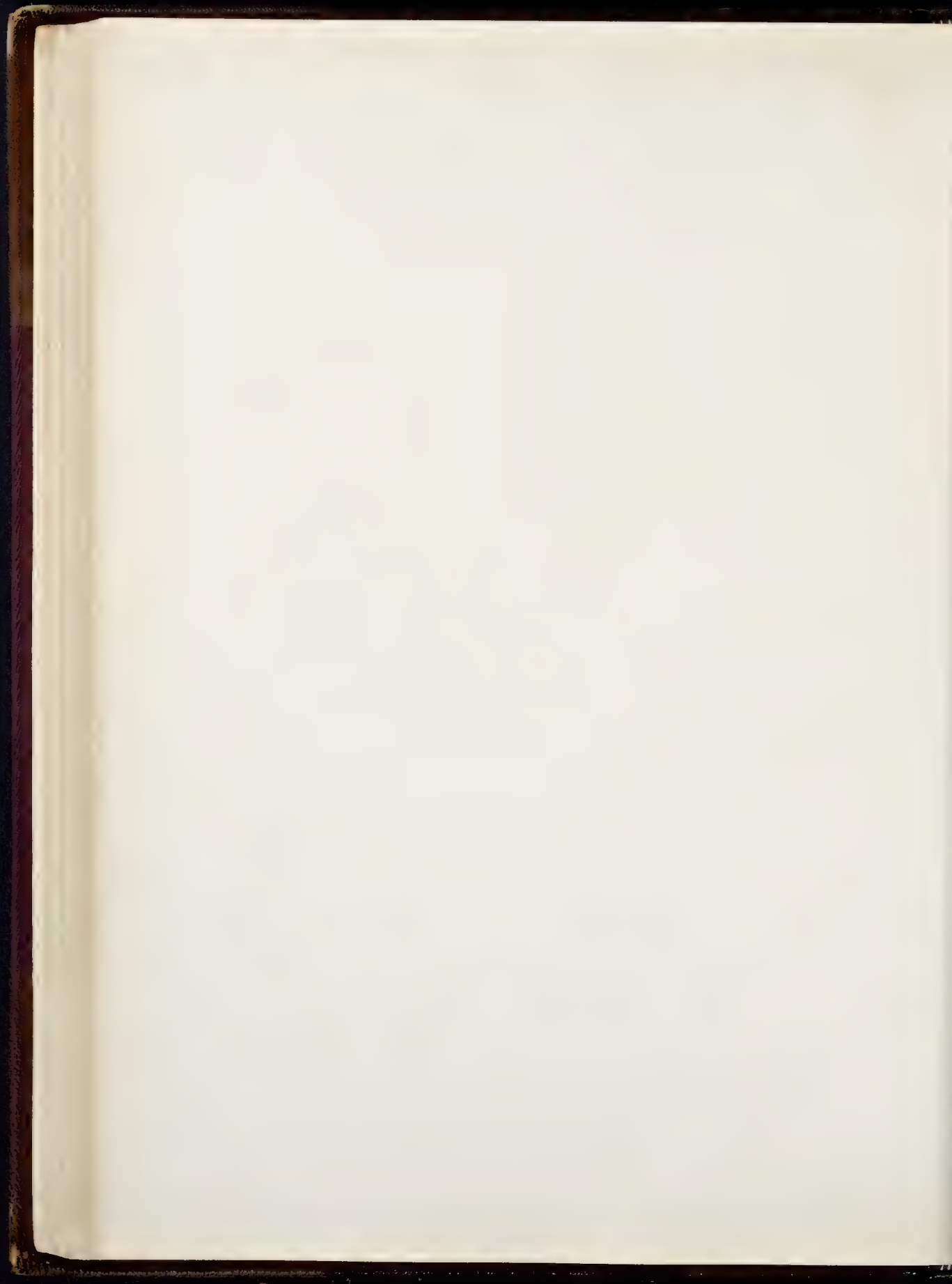
BALTEUS. The term used by some of the commentators on VITRUVIUS for the præinctio, the wide step or landing-place occurring at every eighth seat in the ancient theatres and amphitheatres, and affording a passage round those buildings without disturbance to the spectators, as no one took a seat upon it. TERTULLIAN, *De Spectaculis*, 3; CALPURNIUS, *Ecl.*, vii, 47. It is also used by VITRUVIUS, iii, 5, for the outer fillet or band of the coussinet, cushion or pillow, of the Ionic capital.

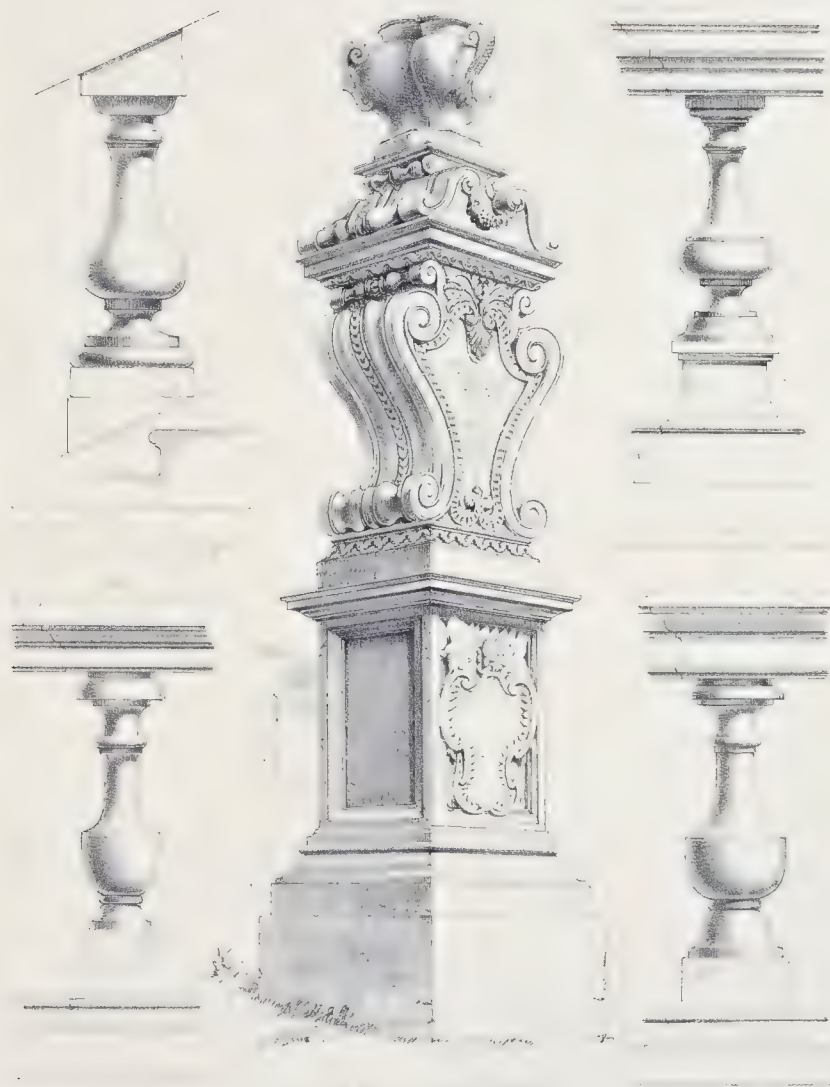
BALTIC TIMBER. The general name given to the pine timber, called Fir, supplied to the English market from the north of Europe, from whatever port it may come. Thus the towns of Krageroe, Langesund, Brevig, Porsgrund, Schien, Laurvig, Tonsberg, Drammen (Dram or Stromsøe), Christiania, Moss, and Frederickstadt, are in Norway, and cannot properly be said to be situated on the shores of the Baltic; Gottenburg in Sweden is also not a Baltic port, although its timber is naturally confounded with that sent from other ports of the same country, as Stockholm, Gefle, Soderham, Sundswall, and Herosand, these several towns coming within the designation of Baltic ports; nor can the timber from Archangel and Onega be included within it.

Other Baltic ports from which timber is supplied, are those in the districts of Biorneborg and Nyland, S. Petersburg, Narva, and Riga, in Russia; and Memel, Königsburg, Pillau, Dantzic, and Stettin, in Prussia. The largest sticks of this real Baltic timber are the Stettin, 18 to 20 inches square; the Dantzic, 14, 15, and even 16 inches square, and 40 to 70 feet in length; the Memel, 13 inches square, and 28 to 35 feet in length; and the Riga usually about 12 inches square and 40 feet in length. The Norwegian and Swedish timber, during their hold upon the market, varied from 5 to 12 inches square, each piece from 8 to 12 inches square being considered as timber, and called a "log"; the smaller pieces, from 5 to 8 inches square, sometimes called *Dram* timber, being styled balks.—*Report of Select Committee on Timber Duties*, 1835. PINE. BALK.

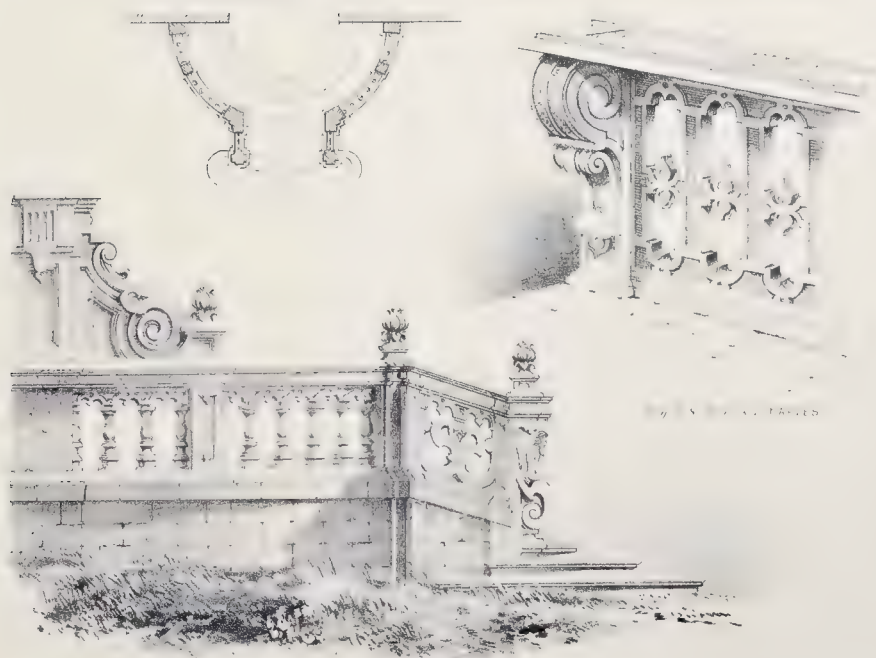
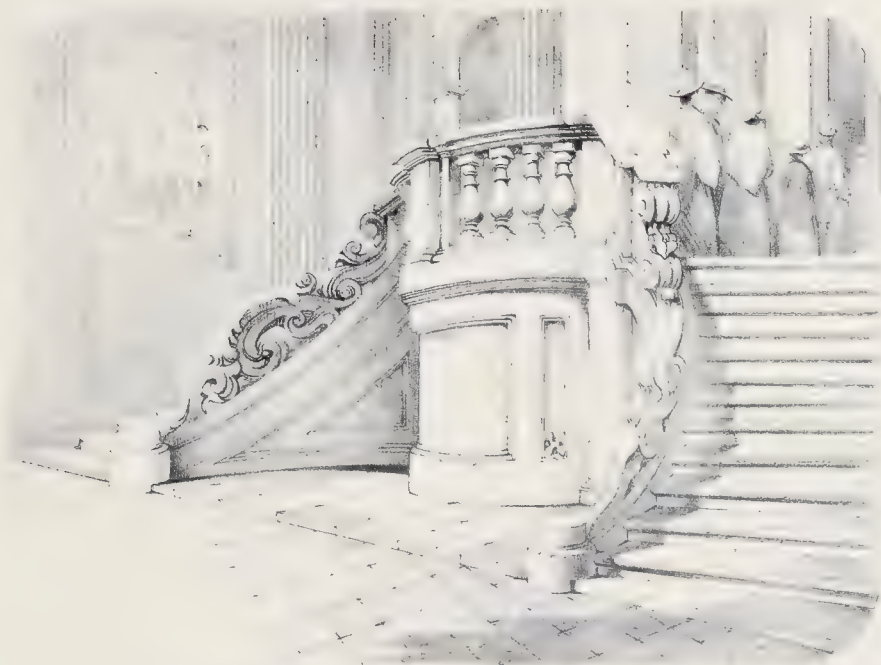
BALTIMORE. The capital of the county of the same name in Maryland, one of the United States of North America. It is one of the leading cities of the Union, and is more agreeable than most others in North America, not only on account of its well built and wide streets, but from having a few streets running diagonally across the various quarters of the town. The principal street is 80 feet in width and a mile and a half in length. There are forty-one places of public worship, besides the Unitarian, which is one of the most considerable, having a dome and vaulted apse; S. Mary's church (Gothic), 1804; the Baptist church, 80 feet in diameter, with a dome, and S. John's church, both designed by Robert Mills about 1817; Robert C. Long designed S. Paul's church, the medical college in Lombard Street, 1807-1812, and the Union bank, the bas-reliefs to the latter were executed by Augustin Chevalier, a French sculptor, who also designed the façade of the Maryland insurance office in South Street. The exchange hotel was designed in 1834 by William Small. The city hall, a plain building, three stories high, with a portico of Tuscan or Doric columns; the court house, 1805-1809, a commodious building of two stories, and constructed of brick and marble, 145 feet long and 65 feet deep, with a dome and a similar portico to that of the city hall; the State penitentiary occupying four acres of ground;







BALUSTRADE



PL. I. SPHALLI GRANITE NAPLES

the house of refuge, the county prison, the lunatic asylum, the hospital, the post-office, the university and three other colleges, the observatory, the public library, the assembly rooms, 1797, six markets, two museums and two theatres, are the other chief public edifices, except two buildings thus described by their architect, B. H. La Trobe; the Roman Catholic cathedral, a building of granite, vaulted throughout, and the then largest church in North America, the dome internally being 70 feet in diameter and 100 feet in height; the exchange and custom-house, in one building, 256 feet long by 140 feet deep, surmounted by a dome 115 feet high, was his boldest work. These seem to have been built about the year 1810; ACKERMANN'S *Repository*, 8vo., Lond., 1821, xi, 31. TUTHILL, *Hist. of Architecture*, 8vo., Philad., 1848, describes this cathedral as of the Ionic order, 190 feet long by 117 feet wide, and 127 feet high to the top of the dome; but by the *Baltimore Directory* for 1845 it has the form of a cross, 166 feet long, 77 feet broad, and 115 feet across the transept. It was commenced in 1806, suspended during the war, recommenced in 1817, and consecrated 31 May 1821; it yet wants the portico on the western front. The exchange was begun, according to the same authority, in 1815. Views are given in HINTON, *History, etc., of the United States*, 4to., Lond., 1830, of the interiors of the Roman Catholic and Unitarian chapels, ii, 526, and of the Battle Monument, i, 459, which is 52 or 55 feet high, including a statue allegorical of the city, executed by Capellano, an Italian sculptor, who also carved the bas-reliefs on the shaft: the first stone was laid 12 Sept. 1815. The monument to Washington, designed by Robert Mills in 1817, consists of a Doric column of white marble, 140 feet high, 20 feet in diameter at bottom, and 14 feet at the top, on a base 50 feet square and 20 feet high, placed in a spot which is 100 feet above high water mark. The statue, which is 13 feet high, can be approached by a staircase in the column; thus making a total height of 173 feet, though other authorities give 160 and 163 feet, the column being 120 feet high: the total cost was about £20,000. The town is well supplied with water, both by pipes and public fountains, there being several of the latter in various parts of the city, covered by small open buildings, each composed of a dome supported by columns, and enclosed by railings.

BALTRAMI or BELTRAMI (GIROLAMO), of Reggio, assisted Bartolommeo Arancini, and was partner with Gaspar Vigarani in 1646. Among other works from his own designs were the church of S. Filippo at Reggio, 1672, and the parochial church of Fabbrico in the principate di Correggio, which was still in hand in 1683. 93.

BALUSTER, improperly written ballister, balluster, and banister (It. *balastro*; Sp. *balaustre*; Fr. *balustre*; Ger. *docke*). An upright support of the rail of a BALUSTRADE. This support may be merely a square, or a turned and otherwise ornamented bar or rod, even less than an inch in thickness, or it may be an exaggeration of this simple condition in the miniature columns employed by some modern architects, and in the bulbous, bellied, and other variations of the *colonnnette*, which consist of a base, shaft, and capital, and have been imitated from the examples designed by the later Italian architects. These last seem to have appeared first in the form of stunted columns, not unfrequently surmounted by a kind of Ionic capital, some of the most remarkable of which are to be seen at Florence and Venice. They have been reduced to rule by SIR W. CHAMBERS, *Treatise*, fol., Lond., 1791, in his section upon the subject. They have usurped the name of baluster, in prejudice to the floriated, scrolled, and interlaced varieties mentioned by the same master, and to the still more modern adaptations in metal, of more than one upright bar with ornament of scrolls, and of natural foliage, or of any two or all of these mixed together. Thus in speaking of the proprieties to be observed in the use of balusters, the architect is supposed only to consider them as COLONNETTES. It is remarkable that the double bellied baluster, sometimes called a bow-shaped

baluster, is seen in some of the earliest examples of Italian and English balustrades. KITTOE, *Illustr.*, fol., Calcutta, 1838.

The pillowed side of the Ionic capital, and the somewhat similar termination of a console or modillion, have also been called by some writers, in imitation of French authors, balusters. 1.

BALUSTER COLUMN. The name given to a pillar used in the so-called Saxon architecture of England for a divisional support in windows, which was either single bellied as at Tewkesbury church A, or double bellied as at S. Benet's church in Cambridge, and at Earls Barton church in Northamptonshire B; or one or two examples of this last sort are given by BUCKLER, *Hist. of S. Alban's*, 8vo., 1847, p. 134, etc.



BALUSTRADE (It. *balastrata*; Sp. *balastrada*; Fr. *balustrade*; Ger. *dockegelaender*). This term properly denotes a row of balusters, but is frequently applied not only to an ornamental railing but to any pierced parapet or other equally low wall; these last may be without a coping or rail at the top, but such an omission is of rare occurrence. When the balusters are backed by a wall, they form a FALSE BALUSTRADE. PUGIN, *Treatise on Rood Screens*, 4to., Lond., 1851, p. 25, observes that "the term balustrade has been usually applied by old writers to screens, and must not be understood in the modern acceptance of signifying a sort of rail hand high. If the word balustrade as used by French and Italian writers be not thoroughly understood, it must lead to a misconception of the old arrangements." BALUSTRUM. In the so-called house of Bacchus and in that of the Tragic poet at Pompeii, there are paintings including among other subjects balustrades (i.e. pierced panels) between pillars or columns; and this species of ornament appears so frequently in other architectural paintings in that city as to lead to the conclusion that it was in common use. No proofs however of antique executed examples are mentioned, except those at Aizani, recorded by KEFFEL, *Narrative of a Journey across the Balkan*, etc., 8vo., Lond., 1831, ii, 205, who says of the bridges over the river Rhyndacus, that the parapet was "once surmounted by balustrades, as is evident from the remains of metal which formerly retained them in their places;" this remark requires professional corroboration, as they are not noticed by TENIER. The pedestal of the obelisk erected by Theodosius in the Hippodrome at Constantinople, at the end of the fourth century, shows curious latticed work, etc., as the balustrade of a gallery. D'AGINCOURT, *Sculpture*, pl. x. The balustrade has been used as a feature of decoration in Italy to a great extent, one example, more than 2,000 feet in length, in the Villa Conti at Frascati may be cited. PARAPET. Some curious analogies with European balustrades are given in KITTOE, *Illustrations of Indian Architecture*, fol., Calcutta, 1838.

BALUSTRADE ORDER. A term proposed for a particular species of columnar decoration in Hindoo architecture, dating from about the second century before our era, and consisting of stunted columns from two to three times their average diameter in height; examples of which are described by A. B. ORLEBAR, *Journal of the Archaeological Institute*, 8vo., London, 1848, v, 176. Those at the palace in Aurungabad are illustrated by GRINDLAY, *Scenery, etc., of India*, fol., London, 1826, ii.



BALUSTRUM. A late Latin term sometimes applied to the cancelli or chancel-screens. PISTOLESI, *Il Vaticano descritto*, fol., Rome, 1838, p. 118, describes the chancel-screen, which is about 12 feet high, in the Sistine chapel, as a *balustrata*. 75.

BAMBERG or BABENBERG (the Latin BAMBERGA, BANDENBERGA, PANIBERGA, or PAPIBERGA). A town in the circle of the Upper Maine in Bavaria. It is built on the banks of the

four branches of the river Regnitz, the communication being kept up by seven bridges, one of which is a suspension bridge 250 feet long by 30 feet wide. The *Max platz* and the five main streets, which are wide, well paved, and well lighted, contain well built houses, many of which are handsome. The cathedral, dedicated to the Virgin, has recently been thoroughly cleansed of the previous limewash, and carefully repaired. The building, which is about 345 feet 9 ins. long by 100 feet 5 ins. broad, is said to have been commenced in 1004, consecrated in 1011, and finished in 1012; but having been destroyed by fire in 1110, it was rebuilt chiefly under Conrad III (1138-1152, which is the reason of one apse and two towers being in a Romanesque style, and the rest mostly in the style *ogival primaire*. It consists of three aisles, with an apse and two towers at each end of the building, with a transept at the west end. The highly decorated vaulting; the Romanesque apse with its gallery; the three fine portals, especially that on the north side; the choir at the western end dedicated to S. Peter, as well as another at the eastern end dedicated to S. George; with the tomb of the emperor Henry II and his wife; are the most remarkable features. The general effect of the eastern end, is that of a very splendid Romanesque work; at the western end the style of the thirteenth century predominates in the choir and transept, while its two towers appear to be of still later date. LANDGRAF, *Dom zu Bamberg*, 1836; HELLER, *Gesch. der Domkirche zu Bamberg*, 1837. Near to it are the humble tenement which formed the residence of Henry the Pious, and the former palace, in the cinquecento style of the year 1571, now a guard-house, stabling, and other offices. Opposite to these buildings is the modern episcopal palace, three stories in height, and in the Italian style of the year 1702 when it was commenced; only half the design has been completed. There is no church, out of the fifteen existing in Bamberg, equal in simple grandeur and internal embellishment to that of S. Martin, erected 1690-1720, and belonging to the Jesuits' college. The church of S. James, built between 1073 and 1109, is remarkable for a portal and a fine dome: the church of S. Gangulph has two towers and a fine altar-screen. The collegiate church of S. Stephen, now used for the Protestant form of worship; a Carmelite convent, now an institution for the education of nurses; the church of S. Mary, a handsome building of the years 1327-1387, so far as regards the exterior of the east end; and the Franciscan monastery, now the seat of the local government and justice, are among the most striking edifices: the court and gardens of the latter establishment are now appropriated to a fruit market. The Benedictine monastery and church, built in 1121, on S. Michael's Mount, was modernised in 1700, and converted into an asylum for aged burgesses; the adjacent provostry is now an hospital for lunatics. The town hall, formerly a convent for Carmelites, was completed in 1476, and restored in 1756; its basement serves as a passage-way for all those who cross the bridge into the island on which the building is situated. The Geierswoerth, a winter residence of the former prince-bishops, stands on another island in the Regnitz, and has its basement occupied as a storhouse for salt, the upper floor being used by the Court of Appeal. The other edifices of note are the lyceum, the gymnasium, and the seminary, the handsome theatre and ball-room, the museum of natural history, the royal library, and the general infirmary with its various schools.

W. H.

BAMBOCCIO (ANTONIO), the son of the sculptor Domenico, was born at Piperno, a town of the Papal States in Italy. After having been the pupil at Naples of Masuccio and Andrea Ciccione, he became a painter of some repute, but better known as an architect and sculptor. For his services in the doorway, built in 1407 and restored about 1770, of the Vescovado at Naples, Cardinal Arrigo Minutoli gave him an abbey, and thereon being in high repute, he executed for different persons various chapels and palazzi now modernized. He died about the year 1435, at a very advanced age, as he inscribed one of

his best works "anno settuagenerio ætatis, 1421." SIGISMUNDO, *Descr. di Napoli*, 1788, writes BAMBOCCIO. 36.

BAMBUSA. A genus of grasses called bamboo, and by the natives *bambos*, well known for its importance to man, but not as yet subjugated to the science of botany. The light and strong stems, as they are called and seem to be, are in reality the leading branches of a jointed and subterranean creeping root-stock, which is the trunk; the shoots or leading branches are hard externally, and covered with a substance similar to flint, but they are hollow internally, except at the knots, where strong partitions cross the stem and divide the interior into a number of cylindrical chambers full of a flinty secretion called *tabasheer*. When full grown, a bamboo, as it is called, namely one of the upright leading branches above mentioned, is a tolerably straight rod, and then begins to bear a number of stiff secondary branches, shooting at nearly right angles from the leading stem. The utility of these leaders or bamboos is so great that it is surprising that some attempt has not been made to cultivate them on the dry and stony soils of some parts of our western coasts and in southern Europe. MONTGOMERY MARTIN, *History of the British Colonies*, 8vo., Lond., 1834, observes that bamboos "if cut at the dark moon will invariably endure for ten or twelve years; if at full moon, they will be rotten in two or three years"; an assertion which seems incredible. MARSDEN, *History of Sumatra*, 4to., Lond., 1784, p. 50, describes the frame-work of the houses of the natives as entirely composed of the bamboo. In the floorings, whole stems 4 or 5 inches in diameter are laid close to each other, fastened at the ends to the timber-framing of the house, and across these, laths of split bamboo, about an inch wide and of the length of the room, are tied down with filaments of the rattan cane; and over these are usually spread mats of different kinds. This sort of flooring has an elasticity alarming to strangers when they first tread upon it. The sides of the houses are closed in with the bamboo half split, opened, and rendered flat by notching the circular joints withinside, and laying it, pressed down with weights, in the sun to dry. This is sometimes nailed on the upright timbers or bamboos, but is sometimes interwoven in breadths of six inches, a matting being thus formed of the size required; the house is roofed in with a thatch of narrow, split bamboo, six feet in length, placed in regular layers, each reaching within two feet of the extremity of that beneath it, by which a treble covering is formed. Another and ingenious roof is formed by cutting large straight bamboos of sufficient length to reach from the ridge to the eaves, then splitting them exactly in two, knocking out the partitions, and arranging them in close order with the hollow or inner sides uppermost; after which a second layer, with the outer or convex side up, is placed upon the other in such a manner that each of the convex, falls into the two contiguous concave, pieces, covering their edges, the latter serving as gutters to carry off the rain that falls upon the upper or convex layer.

Dr. P. BROWNE, *Civil and Natural History of Jamaica*, 2nd ed., fol., Lond., 1789, observes of the bamboo, 12 to 14 feet high and 1½ inch in diameter near the bottom, that "the whole stalk is strong and elastic, and generally used for wattles in those countries where they cover their houses with tyles or thatch; for in both cases they answer extremely well, and are observed to be better than any other sort, as they grow daily lighter, and are found to continue longer sound. I have seen them yet strong and perfect in some of those houses that have been built by the Spaniards in S. Jago de la Vega above a hundred years ago; but these are mostly covered with tyles, and seldom yield any access to rain or moisture, which is observed to destroy them pretty soon, especially as the outward bark is frequently broke in nailing them." Bridges, boxes, and a great variety of utensils and furniture, are made of it.

The following are among the most important species of the numerous varieties of this very useful plant.

B. maxima. Native of Cambodia, Bally, Java, and the Malayan archipelago.

Height, 80 to 100 feet. The most gigantic of all the species, and sometimes found as thick as a man's body; the wood however is very thin.

B. aspera, Amboyna (*bulu potong*); and *B. apus*, Java. 60 to 70 feet, and as thick as a man's leg. *B. mitis*, Amboyna, is as thick, but only attains a height of about 30 feet.

B. balcooa. Bengal (*balcoo bans*). Considered the very best for building purposes; previously to being used it is immersed in water for a considerable time. A variety called *dhodi balcoo* is larger, but not so strong.

B. tulda. Bengal (*tulda bans* in Bengal, *peka bans* of the Hindus). Its growth is so rapid that the leaders, which are sometimes 70 feet long and 4 inches in circumference, arrive at full height in about a month. It is used for scaffolding and for covering roofs. *Sowa bans* is a larger variety, with longer and thicker joints.

B. spinosa. Bengal (*sohor bans*). 30 to 50 feet. It has a smaller hollow than most of the others, and is consequently stronger in proportion.

B. guadua. Western side of the Cordilleras of New Granada and Quito. 30 to 40 feet. A knotted shining trunk 16 inches in diameter.

B. latifolia and *B. tagoara*. In detached obscure spots in tropical America. 25 feet, with joints 18 to 24 feet long and 4 to 6 inches thick.

BANAPOO. The native name of a light coloured wood found obtained in Canara, East Indies, used for buildings and for farm implements. 71.

BAN-BOAY or **BHAN-BHWAY**. The native name for a species of *MIMOSA* obtained in the woods of Tavoy and Amherst, East Indies; it is a strong and useful wood, chiefly employed for posts in building houses. *BAHAI-BYA*, a species of *LAGERSTRÆMIA*, is used for the same purpose. 71.

BANCOUR or **BANCOVE**, see **BANKER**.

BAND (It. *lista*, *listra*; Sp. *faja*; if large, *fajon*; Fr. *cor-don*; Ger. *leiste*). A flat face, *FASCIA* or *TÆNIA*, forming a continuous tablet, which may be either slightly projecting before the adjoining parts of an edifice in which it is employed, in which case it sometimes forms a *STRING-COURSE*, or flush with the face of the wall, *PLAT-BAND*: or recessed within the adjoining parts, *PANEL*. Such bands are usually plain, though sometimes enriched with grooves, sunk beads, panels, or other decorations. The square projection at the base of triglyphs is called the *GUTTE-BAND*, and the name has been given to the cinctures sometimes introduced round columns. **BANDED COLUMNS**. **BAND** has been improperly written for the Indian term **BUND**.

BANDAGE (Fr. *armature*). A name given to the material inserted at the junction of walls, or entirely round a building, whether square as a tower, or circular as at the springing of a dome, to act as a tie to the walling so secured. **BOND**.

BANDED ARCHITRAVE. An architrave interrupted at intervals by rustications.

BANDED COLUMN, **PIER**, or **PILASTER**. A support which has its body interrupted at intervals by one or more broad projecting cinctures, either plain, molded, or enriched, being picked or vermiculated, or carved with decorations in low relief, sometimes different in each separate band. Perhaps no antique example, except that at Ancyra to Jovian, is known to exist of such columns, but the **ANNULATED COLUMN** found in the Norman and later styles of English Gothic architecture, may have originated the bands used in the styles of the Renaissance (of which they are marked features), and continued in the rusticated pillars of more recent date.

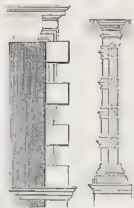
BANDELET or **BANDLET** (It. *listello*; Sp. *fajuela*; Fr. *bandelette*; Ger. *leistchen*, *riemchen*). A term implying "a little band" often applied to a narrow face the size of which is between a fillet and a band. 14.

It is also applied to a small band encompassing a column like a ring, and to the annulet of the Doric capital. 1. 19.

BANDINELLO (*BACCIO*), chiefly a sculptor, was born 1487 and died 1559. The alterations in the great hall of the palazzo Vecchio at Florence were designed by Giuliano Baglioni for Bandinello, but are ascribed by FAMIN and GRANDJEAN, *Archi-*

itecture Toscane, fol., Paris, 1815, pl. 37, to Bandinello, from whose instructions Baglioni prepared the model for the high altar, and the marble decorations of the choir of the cathedral in the same city, as related by VASARI, in *vite* Baccio d'Agnolo (Baglioni) and Bandinello.

BANGKOK or **BANKOK**. The capital, since about the year 1767, of the kingdom of Siam. It extends for three or four miles along both sides of the river Menam, and consists properly of three parts, viz. the old and new palaces; the city, built along the river, about 600 feet from low water mark; and the floating town. The palaces, the temples, and some few dwellings, have brick walls destitute of ornament, and are covered with red tiles, but one temple has green tiles, and the roofs of the royal residence are covered with plates of tin. The new palace, situated on the left bank of the river, and opposite to the old one, consists of several dwellings built in a Chinese style, each house having a diminishing series of three or four roofs, sometimes terminated in the middle by a pinnacle or spire. Besides three Roman Catholic churches, dedicated to the holy cross, the Virgin, and the Assumption, the last of which had been begun a little before 1822, there is one Hindoo temple, and about twenty Buddhist monasteries. Each of these last named establishments consists of cells for the priests, surrounding the outside of a quadrangle bounded by a brick wall or a bamboo hedge, sometimes more than 600 feet in length on each side, with four entrances, within each of which are two large statues, representing warders; every entrance is elaborately ornamented and surmounted by the favourite pinnacle. The area, sometimes used as a garden or an orchard, contains a chapel, a library, and other detached buildings being chiefly galleries filled with statues of Buddha. At each corner of the area are the sacred pinnacles or spires, *PRACHADIS* (literally the roof of the Prah or Lord), or as they are called in Ceylon, *Daghopas*; a group consisting of one large and four smaller ones being distributed at each corner. Besides these, the temple called *Prahchatappan* contained one remarkable pinnacle, close to one of the gateways; this measured 97 feet on each side of the square base, and 162 feet in height. A single, double, or triple quadrangular range of buildings, each row connected with the others at the angles by a shrine (all the angle shrines are also connected with those in the other ranges), intervenes between the outer area and the inner court. The connecting galleries, about 12 or 15 feet broad, are half the height of the temples, and are all occupied by statues of Gautma. If there be only one range, it is only open on the side next the sanctuary. The inner area is generally paved, even with granite from China, and has at each corner a tall pyramid of solid masonry, like all the pinnacles, with an iron trident for an apex. Its centre is occupied by the sanctuary, a spacious and generally lofty hall with narrow but numerous doors and windows, around which last building, and upon a terrace, is a series of small pyramidal pagodas surmounted by pinnacles. The gable ends, eaves, doors, window frames and shutters, the caps and bases of the columns, and the whole of the underside of the roofs, all of solid timber, are laboriously carved, painted, gilt, and varnished in the most profuse manner. The houses in the town are built as uniform as possible, chiefly of wood, raised on posts to prevent inundation at every tide, and are for the most part covered with palm-leaves, but sometimes with tiles; they contain several small chambers (one of which the resident Chinese always allot for the reception of their household gods), and a large apartment on one side, which serves as a reception-room by day and a sleeping-room at night. All these are on one floor, in consequence of an etiquette which prevents any person from allowing another to walk over his head, or over the property of a superior in rank. There are scarcely any streets or roads, each house keeping one or two boats instead of horses. Both sides of the river are occupied by eight or more rows of bamboo rafts carrying houses, about 20 or 30 feet long and 10 or 15 feet



wide, built of boards only, and consisting of a principal centre room serving as a shop, and one or two private chambers, the whole thatched with palm-leaves. FINLAYSON, *Mission to Siam*, 8vo., Lond., 1826; CRAWFURD, *Embassy to Siam*, 4to., Lond., 1828.

BANGOR or BANGOR VAWR. An episcopal city, in the county of Caernarvon in Wales, and the shipping port for the slate quarries in the vicinity. It was formerly a place of great importance, and is supposed to have occupied the whole of the ground between the present town and Bangor Ferry, a distance of two miles; about a mile from the city are the remains of a castle built in the reign of William Rufus. The cathedral church was completely destroyed by fire in 1402; between 1496 and 1500, bishop Dean built the present choir at his own expense, and from 1509 the works were continued by bishop Thomas Skevington, abbot of Beaulieu, who added the tower and nave in 1532 as commemorated in an inscription over the western doorway, but dying before the works were finished, they were continued by bishop John Capon or Salcot, who succeeded him in 1534. The edifice was repaired by bishop Morgan, 1666-1673, and by bishop Warren, 1783-1800. It is altogether 233 feet long, the choir being 63 feet, and the nave, including the width of the transepts, 151 feet, the western tower, although 24 feet square, only projects 19 feet. The body of the church is 60 feet wide, and the transepts are 96 feet long. The height from the floor to the ridge of the roof is only 34 feet, and that of the tower does not exceed 60 feet. The episcopal palace standing near the cathedral was a very indifferent residence until it was improved by bishop Warren. The deanery, seven chapels, a free grammar school erected about 1557, three other public schools, an almshouse, a dispensary, an infirmary, four market-places, and the assembly rooms, with the new villas and cottages for summer tourists, are the other objects of interest in the town; while Penrhyn castle, Plas Newydd, and the Menai and Britannia bridges, are the principal ones in the neighbourhood. The Menai suspension bridge was erected by T. Telford, C.E., in 1819-1825; the clear height is 102 feet above high water mark, with a water-way 552 feet wide. A description of this bridge was published by PROVIS, *Historical, etc., Account*, fol., Lond., 1828. The total weight suspended is about 644 tons. The Britannia railway tubular bridge of wrought iron was erected in 1850 by R. Stephenson, C.E.; the clear height above high water mark is 102 feet, the two centre water-ways of 472 feet each, and the two side ones are 274 feet each. It is described by CLARK, *Britannia and Conway Tubular Bridges*, fol., Lond., 1852. The iron and stonework are each about fifteen times more than the quantities employed in the Menai bridge. FAIRBAIRN, *Account*, etc., 8vo., London, 1849; DEMPSEY, *Tubular, etc., Bridges*, 12mo., London, 1851.

BANGRO or EBONY. The native name for an ornamental wood of British Guiana, South America. 71.

BANISTER, a term improperly used for **BALUSTER**.

BANK. A term explained by NEVE, *Diet.*, 1736, as "a piece of fir from 4 to 10 inches square, and of any length."

BANK. An open office legally termed a shop, for the business of a banker. The subject is very well treated by GILBART, *Practical Treatise on Banking*, 8vo., London, 1849, from whom the following observations are chiefly extracted. A bank should be situated in what is deemed the most respectable part of the town. The bank itself should be a handsome building. A portion of the building will probably be set apart for the private residence of the manager, or of some other officer of the establishment. It is desirable that this portion should be entirely separated from the office. The communication should be only by a single door, of which the manager should keep the key. It is also desirable that the manager's room or private office, often called a parlour, should be so placed with reference to the other parts of the building, that while it has one door open to the public, it should have another door opening into the office, and his bedroom should be so placed that he can hear

any noise made at night in the bank. The office being thus isolated, must then be fitted up with COUNTERS, etc., in the way that will most effectually promote the end in view. And here are three points to be considered, space, light, and ventilation. A banker should therefore take care that his office is large enough for his business; and that it will admit of being enlarged in case that should increase. The lightest part of the office should be devoted to the clerks. It is generally best that many of them should be so placed as to look towards the counter, as the light should fall upon the faces of the customers standing at the counters. The other desks should not have their faces or their backs towards the window, but the light should fall on them sideways. A good system of ventilation should be regarded as an object of the first importance. If a banker does not insist upon the architect providing means to secure this in the most effectual manner, he must be content to be often put to inconvenience through the illness and consequent absence of his clerks. It is desirable at all times to make those arrangements that shall best promote the convenience of the public. The counter should be readily accessible and of sufficient length to meet the requirements of the business; and the cashiers' desks upon it sufficiently wide apart for the public to be promptly served and to stand without jostling one another. Some banks have two counters, one for paying and the other for receiving money. It is especially desirable that the ledger keepers should be placed immediately behind the cashiers. The desk of the chief or head clerk should be placed in such a position that he can see all over the office. There must also be a large secure place of deposit for deeds, papers, and other property that may require peculiar care. **STRONGROOM.**

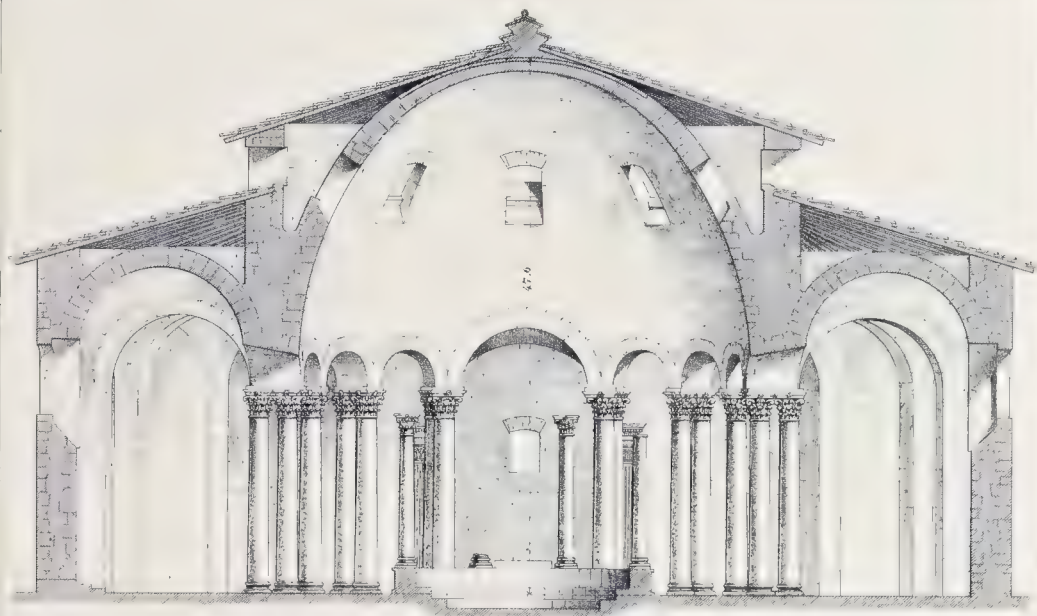
Such are the outlines of the latest dicta as to the building arrangements of a bank, which have been more recently detailed by GRANVILLE SHARP, *The Gilbert Prize Essay on the Adaptation of recent Discoveries, etc., to the purposes of Practical Banking*, 3rd edit., Lond., 1854. Among the executed designs for banks most recently published in the *BUILDER Journal*, are Heywood's bank at Manchester by J. E. GREGAN, vii, 18; Liverpool Branch Bank of England by C. R. COCKERELL, R.A., vii, 43; Northampton New Bank by LAW, viii, 151; the Holborn Branch of the Westminster Bank by H. BAKER, xi, 293; in the *Civil Engineers', etc., Journal*, are the Whitby Bank by J. B. and W. ATKINSON, xiii, 285; the Yorkshire Agricultural Bank by the same architects, xiii, 312; and the National Provincial Bank at Darlington by J. MIDDLETON, xiii, 380. A plan of the Bank of England in London is given in WEALE, *Pictorial Handbook of London*, 8vo., London, 1851, also BOHN's edit., 1854. The Commercial Bank of Scotland, and that of the British Linen Company, both at Edinburgh, are stated to combine the advantages of experience and of liberal expenditure in such a degree as to render them excellent subjects for professional study. The American authoress MRS. TUTTILL, *Hist. of Arch.*, 8vo., Philad., 1848, p. 272, claims that the United States Banking House at Philadelphia, built on the model of the Parthenon, should be considered to excel in elegance, and equal in utility, the edifices not only of the Bank of England, but that of any banking house in the world. **ARGENTARIA.**

BANKED EARTH. The name given to earth which has been dug out of an excavation and is deposited for future filling. Earth not reserved is termed 'spoiled'.

BANKER. A bench or table upon which bricklayers and masons prepare, cut, and square their materials.

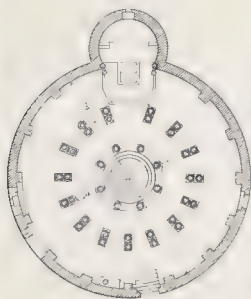
BANKER, BANCOUR, or BANCQUE (Fr. banquier), is explained by HUNT, *Tudor Architecture*, 4to., Lond., 1836, 164, as a short bench by a bedside, having an embroidered cloth called "coster" hanging on it in the same manner as cloths were thrown over tables, and occasionally, a dorse; but by HALLIWELL, *Diet.*, 8vo., Lond., 1850, s. v., and others, the explanation is reversed, and the **BANKER** is the covering for the *coster* or seat, whether a moveable cushion or fastened upon the seat as in a chair, or the mere cloth or leather laid upon the wooden seat;

BAPTISTERY



NO. 18 A

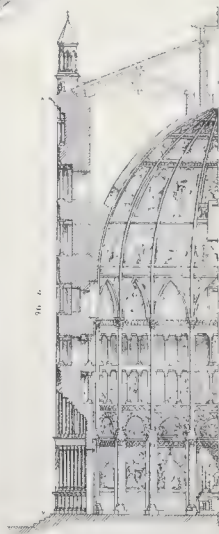
Architect



Plan NO. 18 A



PARMA



Section, PA. MA

Vincenzo Manzoni M.A.

it is the term applied to the coverings for seats in halls, churches, or public rooms, and the seat on which a judge sits in open court; the cushion of a throne is the *banker*. W. H.

BANKSIA AUSTRALIS. The botanical name of a low, shrubby tree called honeysuckle, a native of Western Australia and Van Diemen's Land; it is very abundant and produces a handsome ornamental wood useful for cabinet work and for veneering. The bark is employed in tanning. 71.

BANQUETING HOUSE. The name given to that well known single room "intended for the reception of ambassadors and other audiences of state" (GROSE, *Antiq. Repertory*, 4to., Lond., 1775, i, 86), in the Privy Gardens of the palace called Whitehall, in Westminster, which was built by Inigo Jones as the commencement of a new palace designed by him, whose original drawings for it are in the library of Worcester college, Oxford. It has been well illustrated, with its details, by OCTAVIUS HANSARD, in three sheets, fol., Lond., 1850, and an interesting account of it is given in the *Life of Inigo Jones*, printed for the SHAKESPEARE SOCIETY, 8vo., Lond., 1848, p. 21. The first stone was laid on the 1st June 1619, and the building was finished 31 March 1622, having cost £14,940 4s. 1d. The staircase on the north side was added by J. Wyatt for access to the gallery. The outside stonework becoming so defective that the ornaments were scarcely intelligible, it was recased by Sir John Soane in 1830; it is now used (without attention to the ceiling painted by Rubens) as a royal chapel. The banqueting house at Hampton Court, called that of William III, which is evidently of an earlier period, still exists at a little distance to the left of the Trophy gates; it is a square building with Gothic windows and a flat roof, having a turret at the western corner.

BANQUETING ROOM. A term peculiarly English, which originally did not mean as at present a place prepared for state dinners, but an apartment for the display of a "refection", as it was properly termed, in which fruits and wine were chiefly served: JOHNSON, *Dict.*, 4to., Lond., 1817, s. v. banquet. The corporation of London had such a banqueting room built at Tyburn, whither, after the members had dined together in the city, they conducted their families for an afternoon's dessert. Such rooms, like that built temporarily by GERBIER for himself in 1628, were occasionally used for the performance of a play or masque. The banqueting room at Kensington was commenced directly after the death of William III, and finished about the year 1705. It was originally divided into three rooms adorned with Corinthian pillars, friezes, and niches for statues bearing girandoles. There is a circular room at each end, one intended for a drawing room, the other for a music room, the middle apartment was a ball room. The broad windows afforded a spring or summer stand to the queen's myrtles, oranges, and other evergreen exotics, which were removed in the winter. Near the western end of the palace may be observed a gateway leading directly to the banqueting hall, through which Queen Anne used to be carried in her chair when she went to her illuminated galas on spring evenings; and DEFOE says, that after the queen had built her greenhouse at Kensington palace, she was pleased to make it her summer supper room. STRICKLAND, *Lives of the Queens of England*, 8vo., Lond., 1854, viii, 209-210. DINING ROOM.

BANQUETTE. A French term introduced into the English language for a footway generally about 18 inches wide, serving for a single person only, and raised above the carriage-way of a road or the channel of an aqueduct; it has also been given to a window-seat, and to the back of the window above the seat. The word is sometimes used for the step or raised platform placed for the exhibition of plate or glass at the back of a sideboard. 1, 2, 25.

BAPTISMAL FONT, see FONT.

BAPTISTA (ANTONIO) was practising at Rome about the year 1623, as an arch of triumph, erected in honour of Urban VIII, was designed by him and engraved by Cruger.

BAPTISTERIUM or **BAPTISTERY** (It. *battistero*, *battista*).

terio, *battistero*; Sp. *baptisterio*; Fr. *baptistère*; Ger. *taufkapelle*). A basin, pool, or other place for bathing. As used by PLINY, *Ep.* v, 6, xvii, 2, it does not mean a bath sufficiently large for the total immersion of the body, but only a vessel for pouring cold water over the head. The term has been applied to the bath in the circular chamber of the baths at Pompeii (c. fig. 2, pl. xcvi), and to the tank in the triangular court of the suburban villa of the same city. It was adopted at first as the name of the tank or cistern used for baptism, but the baptistery (sometimes called *aula baptismatis*) now means the place or edifice in which the sacrament of baptism is administered. Until the time of Justin Martyr there seems to have been no fixed place for baptism, but afterwards, viz. about the middle of the third century, buildings detached from the church to which they were supposed to belong, were erected for the special purpose; consequently wherever the followers of the faith formed a nucleus, they required not only a basilica for a church, but a building as a baptistery for the crowd of applicants and spectators, and this was literally a large bath room. "By a baptistery, which must not be confounded with a modern font, is to be understood an octagon building with a cupola roof resembling the dome of a cathedral, adjacent to a church but no part of it. All the middle part of this building was one large hall capable of containing a great multitude of people; the sides were parted off and divided into rooms, and in some, rooms were added withoutside, in the fashion of cloisters. In the middle of the great hall was the octagon bath, which, strictly speaking, was the baptistery, and from which the whole building was denominated." "Water was conveyed into one or more of the side rooms, for as they often, if not always, baptized naked, decency required that the baptism of the women should be performed apart from that of the men. Some of the surrounding rooms were vestries, others schoolrooms, both for the instruction of youth and for transacting the affairs of the church; and councils have been held in the great halls of these buildings." ROBINSON, *History of Baptism*, 4to., Lond., 1790. It was necessary they should be capacious, for as baptism, which was performed by immersion, was only administered, except in cases of necessity, on the festivals of Easter and Pentecost, the candidates were numerous and the spectators even more so.

From being detached buildings, the transition, through being attached (as at Canterbury, where the font stands in a circular building called Bell Jesus, communicating with the north side of the cathedral), to being a portion of a church close to the entrance (as in the cathedral church of S. Paul's, London; a remarkable instance of a part of a church being reserved for baptism by immersion still remains at Cranbrook in Kent) was easy, and seems to have generally obtained throughout Europe, except in the episcopal cities of Tuscany, where detached buildings are still the rule. It appears that baptisteries were not placed within the churches previously to the sixth century, and that until the ninth century baptism was not administered in all the churches of a city, but only in the particular edifice appropriated to the purpose. This custom prevailed at Poitiers in France, until the seventeenth century, in favour of the curious rectangular baptistery called the *Temple S. Jean*, illustrated by GAILHABAUD, *Monumens*, 4to., Paris, 1850, ii, 70. A sort of separate chapel enclosing the font has sometimes been placed within a church, of which perhaps the only perfect examples in England are the stone one at Luton church, Bedfordshire, and the wooden one at Trunch church, Norfolk.

The useful list of early baptisteries given by HOPE, *Hist. Essay*, 8vo., Lond., 1840, may be enlarged by reference to D'AGINCOURT, *History of Art*, fol., Lond., 1847, architecture; and ISABELLE, *Les édifices circulaires*, fol., Paris, 1843. It includes the baptistery in the catacomb of S. Pontianus at Rome (D'AGINCOURT, pl. 63), the round church of Sta. Costanza called a baptistery at Rome, supposed to have been built by Constantine, close to the church of S. Agnese fuori le mure

(GALLY KNIGHT, *Eccles. Arch.*, fol., Lond., 1842, i, 3; ISABELLE, pl. 34, 35, 37, 42), and the octagonal baptistery said to have been built by pope Sixtus III, 432-440 (the chapels being probably subsequent additions), and to which, in order that the spectators might more easily view from all sides the tank that served as a font, he gave the octagonal shape seen in the saloons of public baths, which seems since to have served as a model for most of the later detached baptisteries erected to the utmost confines of Italy (GALLY KNIGHT, i, 5). This building, the roof of which is supported by the eight largest known porphyry columns, was consecrated to S. John the Baptist, as all similar ones have since been, and gradually gave its name to the basilica of the Lateran, with which it was connected (HOPE, *Essay*). It is also called the baptistery of Constantine, or the Battisterio di S. Giovanni in Fonte, and is given by LETAROUILLÉ, *Edifices de Rome*, fol., Paris, 1840, pl. 230; D'AGINCOURT, pl. 63; and ISABELLE, pl. 28, 31). In process of time there were baptisteries at most of the principal churches, MABILLON, *Iter Ital.*, i, 25, who also observes that "in ecclesiâ solum quâ episcopus sedebat erat baptisterium," which principle still obtains in Italy in favour of the church claiming precedence in a city, and of the church of each rural archpresbyter, which latter edifice is called *plebis* or *de plebe* (It. *della pieve*). Some cities, indeed, have only one baptismal church to this day, and the priests of the neighbouring churches do not baptize in their own fonts until they obtain a little water from that in the cathedral in order to give validity to their performance of the sacrament. This is the practice for instance in the diocese of Milan. In Rome however there are many churches which have baptisteries, while other Italian cities had only one at first; in the middle ages two, an Unitarian and a Trinitarian, and in modern times only one, and that the Trinitarian or Catholic. At Ravenna both are octagonal, but the Trinitarian, called S. Giovanni in Fonte, and said to have been repaired in 451, has the two angles on the right and left hand side, at the upper end, carried out in a semicircular form and parted off for oratories or chapels; this was built by Valentinian (ISABELLE, pl. 42; D'AGINCOURT, pl. 63), the other was erected by Theodoric, 493-526 (D'AGINCOURT, pl. 17 and 73).

Other baptisteries important in the history of art, are Sta. Maria Maggiore near Nocera (ISABELLE, pl. 39; D'AGINCOURT, pl. 8); that at Parenzo built in 542 (D'AGINCOURT, pl. 73); the octagon one at Volterra, of the seventh century; the polygonal one in the basilica of S. Stefano at Bologna, supposed to have been erected about 710 (*Della chiesa di S. Sepolcro . . . e in generale dei Battisteri*, 4to., Bologna, 1770; D'AGINCOURT, pl. 28); the octagonal one at Citta Nuova (D'AGINCOURT, pl. 63); the dodecagonal building of the lower Greek style at Canosa; the octagonal edifice formerly the cathedral at Florence (D'AGINCOURT, pl. 63; RUGGIERI, *Scelte*, 4to., Florence, 1755, iv, 17; GALLY KNIGHT, i, 19; ISABELLE, pl. 49-52); the octagonal one at Cremona (CAMPI, *Cremona*, 4to., Milan, 1585); and perhaps the baptistery in front of the cathedral church at Torcello, separated from it simply by a vestibule common to the two buildings (D'AGINCOURT, pl. 25). The baptisteries at Florence, Oneglia, and Novara, are supported, as is the case with nearly all the very early baptisteries, by antique columns. Such erections as these, as at Aix and Riez (ISABELLE, pl. 32), form the original class of Italian baptisteries. Among similar edifices erected in imitation of previous buildings, are that at Padua, commenced on a square plan, but finished circular; that at Verona with an octagon font 10 feet in diameter; that at Pisa (MARTINI, *Theat. Basil. Pis.*, fol., Rome, 1728; ISABELLE, pl. 57); that at Parma, having sixteen sides internally, the most splendid in Italy (GALLY KNIGHT, ii, 23, ISABELLE, pl. 59); and the octagonal one at Pistoia, built in 1337. The baptistery at Siena (1180) is a crypt under the choir; that at Como is a circular building designed by Bramante. At Paris there was a circular one called S. Jean le Rond; that at Worms was destroyed during the Revolution; that at Bonn, dedicated to S.

Martin, gave way from age in 1813. The tanks or baths called baptisteries by the English members of the Baptist persuasion, are not always placed in the chapels (ROBINSON, 541-546). 1. 2. 6. 14.

BAR (late Latin, *barra*; It. *barra*; Sp. *tranca*; Fr. *barre*; Ger. *stange*). This word originally meant a single piece of wood or metal, of any shape in section, placed horizontally like the rail of a gate, in order to form an obstruction. Thus it is employed for the iron rail under the handrail of a staircase (Fr. *chassis*); for a gate, BARPOST; for a gateway or gatehouse, as at London and York; and for the fastening dropped into a mortice behind a door or shutter, DOOR-BAR, LATCH-BAR, SADDLE-BAR, SPLIT-BAR, SWING-BAR. In process of time the word was also used for posts or rods placed for the same purpose in an upright position, such as the supports of a RAILING or CAGE. It is also employed, in a mixed sense, for the light pieces which form the vertical and horizontal divisions between the panes of glass of a sash, whether made in wood (Fr. *petit bois*) or metal (Fr. *petit bois en fer*, *en fer blanc*, etc.) ANGLE-BAR, SASH-BAR, WINDOW-BAR. A bar, in the present technology of building, is usually a flat piece of metal not more than an inch thick, nor more than six inches wide.

The term is also applied in a court of justice to an enclosure made with a strong partition of timber three or four feet high, for the purpose of preventing the persons engaged in the business of the court from being inconvenienced by the pressure of the crowd of the public. The word is similarly applied in the houses of parliament to a partition also breast-high, which divides, from the body of each house, a space near the door, beyond which the members and clerks only are admitted.

BAR is also used for the housekeeper's room, office, or countinghouse of an hotel or tavern, which should always be placed in a position to command the front and back entrance doors and the principal passages; it should contain an iron safe, a closet for books and papers, and a nest of pigeon holes marked with the number of the different apartments, for parcels belonging to the lodgers. The room is consequently generally small, having windows on three or four sides; but if there be no bar-parlour, or living room for the owner attached to it, it is made large enough to contain in addition the usual furniture of a living room, and mirrors are sometimes used to add to the power of supervision. In small inns the room is also made as large as possible, being used as the storeroom for glass, china, linen, and plate. Speaking-tubes to the kitchen, etc., and bells for the different servants, are peculiarly necessary fittings. In public-houses the bar is simply the part behind the counter in the public room.

BARABÉ (PIERRE À) living at Versailles about the year 1774, was born at Rouen, and studied architecture at Paris, where he published several of his own designs engraved by himself.

BARADAN. A village in Curdistan situated about eighty miles north of Bagdad. It is remarkable for a mound little inferior to the tower of Babel, consisting of a raised platform two hundred yards square and thirty feet high. From this mass rises a quadrangular tower ninety yards long, fifty yards wide, and eighty feet high; from the quantity of broken bricks it has evidently, like the Babylonian ruins, been coated with them. KEPPEL, *Journey to India*, 8vo., Lond., 1827, i, 290.

BARAHDARI or BARAHDURRI. This term signifies a hall with twelve doorways or entrances, which is one of the indispensables of an Indian palace; hence the term is applied to a palace or place of pleasure, and even to a mausoleum, which, having been built in the lifetime of a Mahomedan person of wealth, as an ornament to a garden, serves after his death as his tomb. КИТОВ, *Illustrations*, fol., Calcutta, 1838, pl. 1 and 4.

BARATTA (GIOVANNI MARIA), a pupil of Algardi, is stated by FALDA, *Nuovo Teatro*, iii, 4to., Rome, 1665, to have designed the frontispiece with the pediment, the external decoration of the dome, and the campaniles of the church of Sta. Agnese, in

the Piazza Navona at Rome; the remainder of the work having been designed by Borromini. He is also said by the same author to have executed the façade (others say the whole) of the church of S. Nicolo da Tolentino near the Quirinal at Rome, the great altar of which was designed by his master Algardi. FERRERIO, *Palazzi di Roma*, pl. 103, gives an elevation of the private house of his publisher, Gio. Gia. di Rossi, in the Via Longara at Rome, designed by Baratta, who is supposed to have died about the year 1687. 54.

BARATTIERO (NICCOLA). In 1178 Sebastiano Ziani, doge of Venice, induced two architects, whose names have been lost, to visit that city. One of these artists came from Constantinople, and rebuilt the church of S. Mark; the other was a Lombard, who erected in the piazzetta di S. Marco the two granite columns removed from Constantinople, and was called Niccola Barattiero ("Nick the blackleg"), on account of his asking and obtaining as a reward, legalized gambling in the space between these columns, where afterwards criminals were executed; he built a wooden bridge at the Rialto, and performed many other useful works, for which the republic assigned him a considerable annuity. 3.

BARBA (ALONSO), was *maestro-mayor* of the cathedral church at Jaen in 1581, where he had been employed for more than twenty years as pupil and *aparajador* by Andres de Valdelvira. 66.

BARBA (GAETANO) designed and executed in 1780 the palazzo Miranda, now di Ottajano, at Naples. 28.

BARBACAN, frequently written BARBICAN (It. *barbacane*; Sp. *barbacana*; Fr. *barbacane*; Ger. *schanze*). There seems to be no doubt that one, and perhaps the original, meaning of this word was that given by ROQUEFORT, *Dict. Etym.*, 8vo. Paris, 1829, "a perpendicular chink, cleft or crevice left for the discharge of water" in the wall of a terrace, or of a story liable to be inundated: it was doubtless found convenient to use such a slit or loophole as "an opening for the discharge of missiles upon an enemy", the second definition given by the same author. When used in warfare it would probably soon be covered with "a sort of penthouse made of wood, to protect an opening made in castle walls". A manuscript of the fifteenth century in the British Museum, exhibits a moveable tower with an arrangement in the upper part of it as a protection for archers, and illustrates what was considered to be a barbacan in early times. Such at least is the opinion of GODWIN, *Builder Journal*, viii, 439, accompanied by an article with some good illustrations of this form of the barbacan, chiefly communicated by PLANCHÉ to the *Gentleman's Magazine*. The same article supplies the following information. "Afterwards the name took a wider significance in England and came to express the outer work, either of wood or of stone, to which they were attached." FLORIO, *World of Wordes*, fol., Lond., 1598, explains *barbacane* to mean only "an outnooke or corner standing out of a house; or jettie." And it may be thus understood how the word came to signify, as COTGRAVE intimates, "a sentrie, scout house, or hole"; and a watchtower according to STOW and GROSE; a watchtower or military fence according to CAMDEN, *Britannia*, 1586. The derivation of the word has been a source of difficulty; Celtic and Saxon origins have been assigned, but the best authorities state that it was Arabic (FORD in the *Handbook for Spain* gives *bab-el-cana*, "the gate of the mount") adopted by the Italians and Normans: the word is divided into two portions by GULIELMUS ARMORICUS, *Gesta Philippi*, A.D. 1203, who says, "cepit per vim fortericiam, quam vulgus barbam canam vocat, quæ erat firmata in capita pontis," which shows that at that date the word was also applied to a *tête du pont*. It was also called *muris exterior*, or *promurale*, and *antemurale* in a charter given by DUCANGE, s. v., dated 1232, where it is explained as "barbacana, qui est murus brevis ante murum nostri orti", the modern sense of the word, as concisely stated by GROSE, *Antiquities*, 4to., Lond. 1801, pref., "an outwork; and frequently advanced beyond the

ditch, to which it was then joined by a drawbridge, and formed the entrance into the castle." Sometimes this consisted of a plain wall, with a portal and drawbridge, but was more frequently constructed like a fortified gateway with the same appendages, flanked by towers. Here a porter was stationed to keep watch and ward, to announce all state arrivals, and to detain strangers until their business was made known to the governor, and orders received for their admission. In 1240 the barbacans at Carcassonne were evidently merely outworks, but in the rearrangements of the fortifications about the year 1257 the name of Barbacane was given to an immense tower. VIOLET LE DUC, *Dict.*, 8vo., Paris, 1854, 345, 352. There is a small stonework covering the gate of Bodiam Castle in Sussex, still called the Barbican; and the Walmgate bar and barbacan at York, and the barbacan at Scarborough Castle may be mentioned as good examples; the whole subject may be best summed up in the words of the description given in the GLOSSARY, s. v., of the barbacan at Carlisle Castle: "The latter is a remarkable instance, having the station for the archers over the gate, with a parapet wall on both sides; that on the inside having long narrow loopholes instead of the usual embrasures, to enable them to shoot down on the heads of parties attacking the inner gate in case the outer one should be forced; there is also a passage or alure on the side wall communicating with the other parts of the fortifications." 1, 17, 19.

BARBACOA. The name given by travellers in South America to a sort of bridge or causeway formed where the road lies through a small narrow mountain pass, or where there is an obstruction caused by a rock which cannot be avoided: small stakes about three and a half feet long are driven into the ground or into the crevices of the rock; over the ends of these stakes are fastened strong branches of trees; the interstices are filled up with clay; and the whole is covered by a sort of matting composed of plaited branches and reeds. If the ground admits, which however is seldom the case, a pile of stones is built up beneath the barbacoa, extending to at least one half its breadth. TSCHUDI, *Travels in Peru*, 8vo., Lond., 1847, p. 388.

BARBARI (BENEDETTO), is mentioned as a Cremonese contemporaneous *architetto esportissimo* by CAMPI, *Cremona rappresentata*, fol., Crem., 1585.

BARBARICUM OPUS. A Roman term, which was correspondent, according to PLINY xxxvi, 61, with the *opus subtegulanum*, and signified the best sort of composition floors, *opus signinum*, in which pieces of marble of all shapes and colours were imbedded; in these floors the chief aim was to collect the greatest variety of marbles; they seem to have preceded and to have suggested mosaics. PAVIMENTUM.

BARBASTRO or BALBASTRO (the ancient BELGIDA or Bergidum). A city in the province of Huesca in Spain. It possesses straight, well paved streets, several *plazas*, two bridges of stone and one of wood. The cathedral is a plain Gothic edifice of brick 144 feet long and 91 feet wide; the three aisles are of equal height, the centre one or nave being 40 feet wide; the stalls date about the year 1590. This edifice suffered by the restoration and repair done 1595-1604, at the expense of bishop Charles Muñoz, who built the episcopal palace, which is considered an ineffective building externally, but well planned for its purpose. The other buildings of any importance are the churches of the six convents; the *casa consistorial* or *del ayuntamiento*, which is the town hall and has a fine staircase; the *casa* of the suppressed *Mission de S. Vicente de Paul*, with magnificent interior arrangements; the *collegio de Escuelas pías*, also praised for its interior; and the theatre. Most of the other public buildings were destroyed during the disturbances of the present century. 85.

BARBERI (GIUSEPPE), at the end of the eighteenth century designed the mansion in the Via dell' Orso at Rome, illustrated by LETAROUILLY, *Edifices de Rome*, fol., Paris, 1840, pl. 24.

BARBIONE (NICCOLO). A native of Città dello Castello, added in the sixteenth century the cupola to the cathedral

church, and built the present façade, the portico, and the loggia del Grano of the Palazzo Apostolico in that city. 28.

BARBUSTAR, see BEN ABU BARBUSTAR (ABUBEKER).

BARCA (PIETRO ANTONIO) is entered in the list of architects to the cathedral church at Milan between the years 1599-1605; he was one of the eleven competing architects who submitted to Cardinal Federico Borromeo (1584-1632) designs for the façade of the cathedral, but who all concurred in preferring a design by their predecessor Pellegrino Tibaldi (Pellegrini). FRANCHETTI, *Storia*, etc., 4to., Milan, 1821, p. 36.

BARCELONA (EL PADRE FRA LUIS DE) was appointed by the chapter of the cathedral at Seville in 1660 to report with Diaz and De la Pena on the condition of their church. 66.

BARCELONA (the Latin BARCINO). The capital of the province of the same name, is a fortified seaport, and the commercial city of Spain. It consists chiefly of a citadel built in 1716, of the old and new towns with seven gates, and of the suburbs of Barceloneta and Gracia. The city having been several times enlarged, old gateways are now to be seen amongst the houses. The new town and the suburbs are laid out with considerable attention to regularity; the straightening, widening, and alignment of the streets of the old town were commenced in 1802, and the *rectificación à cordel* has been steadily continued in defiance of their tortuous character, on a scale of 10, 15, and 20 feet in width according to their classification. The streets are supplied with brick drains entered into sewers which discharge themselves into the sea: indeed the lighting (by gas in 1842), paving and draining, which would be considered excellent even out of Spain where they are almost unique, have been a subject of constant attention ever since 1827, when a local tax was imposed for those objects. Amongst the local building regulations is one which increases the limit of height for houses from 58 feet to 62 feet 6 ins. This great height was occasioned by the difficulty of finding within the walls room for more than about five thousand houses, which are commodious, generally four or five stories high, and have numerous windows with balconies exhibiting a sort of competition as to variety of form and decoration. The houses are chiefly built of brick, and the ceilings formed of timber joists filled up with half brick arches, but there are many, particularly in the new town, constructed of hewn stone. In the extensive municipal improvements already noticed and in the new streets, fronts on arcades with shops are prominent features; the old fronts are fast disappearing as well as the gardens which formerly occupied a considerable portion of the town and were each large enough to afford space for several streets. The principal of the eight *paseos* is the Rambla, about 2,500 feet in length and 30 feet in width, separating the old town from the new one; it is considered to form an almost unrivalled promenade, and is a really fine avenue of three closely planted rows of trees.

In the *calle del Paradis* are eleven antique columns of the Corinthian order built up in the walls of the houses; they are about 34 feet high and 3 feet 7 inches in diameter, standing on a basement about 10 feet in height; the bases have no plinth; and each length of the architrave, all that remains of the entablature, is in two thicknesses and about 9 feet long. Some arches of an aqueduct from Colcecerola, but only 2 feet 7 inches high, remain in the *calle de Capellans*; and in the church of S. Miguel, now closed, is a much defaced mosaic pavement with tritons and other marine subjects; the font of this church seems to have been part of a candelabrum.

The present cathedral called the *Seu* or *Seo* and dedicated to the Holy Cross, was commenced in 1298 (?) and finished from the east end up to the back of the choir in 1329; the Pantheon or crypt-chapel of Sta. Eulalia, with an elliptic arch spanning the descent to it, was constructed by Jaime Fabra in 1338; and the greater portion of the nave, with the rest of the edifice, was built between the years 1420 and 1430. The apse has some very fine stained glass, and as the light of the cathedral is dim, the windows being very few, it is so dark in parts that the

worshippers are frequently undistinguishable; taken altogether there is scarcely a church so solemn, so picturesque and so artistic. (Notes in *Builder Journal*, vol. ix, p. 733.) The tabernacle has a semicircular reredos formed by ten pillars with open arches instead of the usual solid wall: the upper portion of this screen is singularly delicate and attracts notice as much as the arabesque work and sculpture, as well as the ludicrous objects decorating the choir or as the excessively minute, fanciful, yet bold work of mixed Gothic and Renaissance in the pulpit, and its staircase. The organ is loaded with statues, busts and festoons; the chapels contain some fine tombs. The exterior of the church is not very remarkable; the lantern has never been finished, as is the case with the façade which is now decorated in fresco; but there is considerable grandeur in the effect of the two handsome towers, each having an attached circular turret staircase placed on a lofty flight of steps; the construction of their ground and upper stories deserves attention. The *puerta de S. Severo*, a work of the fifteenth century, gives admission into the immensely large Gothic cloister forming a component part of the edifice, which with its chapels indenting all its sides, are filled throughout with a fertility of invention which, setting all conventional rules at defiance, yet excites great admiration. The *retablos* and the original Gothic framework to the paintings are all curiously worked. The Norman doorway in these cloisters is excellent. The fonts are numerous and curious; and the ironwork throughout, especially to the *rejas* or iron gates, deserves notice. The exterior of the *Sala Capitular* is also highly praised for its elegant yet simple design and ornamentation. The sacristy contains the frontals or altar coverings bought in London at the sale, temp. Henry VIII, of the Roman Catholic decorations of the cathedral church of S. Paul.

The other churches of importance are those of S. Pablo del Campo, belonging to the year 914, with a small but remarkable cloister built at the end of the twelfth century; S. Pedro de las Puellas, a low dark church begun in 980; Sta. Maria or Sta. Agueda, the chapel (finished in 1173) of the kings of Aragon, with a rich roof, and two staircases in the thickness of the walls which led to the seats of the divided sexes of the suite of the sovereigns; Sta. Anna consisting of a single nave built in 1148 with a more modern cloister, etc.; the choir was originally in the middle of the nave, but is now at the end of the church; "the two entrances to the building show it has been a truly claustral church" (MADOZ); SS. Justo y Pastor, dating from 1346, has also only one nave, which is 130 feet long, 78 feet wide and 65 feet high; the *altar mayor* begun in 1820 and not yet completed is encompassed by twelve columns of the Corinthian order; Sta. Maria del Mar with two towers was rebuilt in 1328 and nearly finished in 1377, but not altogether until 1483; this is the largest church in the city except the cathedral and has a nave and two aisles, an *altar mayor* erected in 1731 somewhat resembling that in the *Seu*, thirty-two chapels, a choir with finely-sculptured stalls behind the altar mayor, and some rich stained glass; on one side there is a tribune communicating with the palace of the captain-general by a bridge of two arches now out of repair; Sta. Maria de las Junqueras, begun about the year 1386; S. Jaime, in the least reputable quarter of the city, has a noble nave built in 1394; Sta. Maria de los Reyes or del Pino, begun in 1380, finished in 1414, having a fine circular tower, a rich portal, and one of the largest and most superb naves in the city; N. S. del Carmen, 1418; S. Francisca de Paula, 1574, the interior gutted by fire in 1854; S. José, 1619; S. Agustin, very much admired by the Spanish critics, begun by Pedro Beltran in 1718 according to LLAGUNA, in 1750 according to MADOZ, but unfinished; S. Miguel del Puerto built in 1753 by Pedro Cermeño; and S. Cucufate del Horno, or S. Culgat, rebuilt in 1827. Besides these there are fourteen other churches and chapels of no particular importance. Among the conventual establishments the most remarkable are those of the Servites, now a barrack, of which the chapel of the Virgin

de los Dolores was as large as the church to which it was attached; S. Felipe Neri, now the French church, built in 1673; S. Sebastián built in 1513; and S. Francesco de Asis, 1214-1297, with a cloister finished in 1334. Only about thirteen of the monasteries and convents are now devoted to their original purposes, the other thirty such establishments which formerly existed having been supplanted by government, municipal, and other institutions and factories. The convent de la Merced, finished in 1651, has always been celebrated for its magnificent staircase, and the cloister of two stories in height with Doric and Ionic columns. The armoury and cannon foundry in the citadel exhibit the style of the year 1378 in the groined vaulting of their ground floor.

The *real palacio* in the *plaza del Rey*, near the cathedral, was the residence of the counts of Barcelona and kings of Aragon until the year 1131; it was afterwards the palace of the viceroy, and in 1487 it was partly occupied by the tribunal of the Inquisition, which was forced in 1718 to yield a portion to the nuns of Sta. Clara; the building is now partly in the hands of these ladies, and part belongs to the College of Surgeons, the offices of the Inquisition having been used as a prison, and afterwards destroyed. There are two other palaces, one the *palacio de la Condesa*, formerly belonging to the Templars; and the other the *palacio de la Reina*, originally built in 1444 as the *hala del draps*, but belonging since 1652 to the Crown, and which being afterwards used by the viceroys or captains-general, was considerably altered by Count Roncali, but has been since 1845 undergoing judicious restoration.

The *casa de la Diputacion*, or the House of the Provincial Assembly, in the plaza di S. Jaime, occupied since 1718 by the *Audiencia* or courts of law, is one of the very remarkable buildings, and the finest monument of mediæval times in the city, excepting the cathedral. It was built in 1436, but has been enlarged, and disfigured by a façade of a Corinthian order, designed by Pedro Blay in 1598, and finished in 1602. The courtyard or *patio* is really a surprising work; on the right hand of the entrance is a spacious hall, facing another of less dimensions, which forms the entrance from the exterior. From this a staircase leads to a graceful gallery, surpassing in boldness many constructions in iron (*Illustr.*, pl. 88). The columns are of basalt, six inches in diameter, and in section are formed by four semicircles; these are spaced at distances of six feet six inches, and are 16½ feet high. The court is formed by six arches on the side of the staircase and on that opposite to it, while the other two sides have each seven arches. The staircase has a landing at the top of the flight, shown in the drawing, before entering the gallery, and this landing is not encumbered by the angle column, its duty being fulfilled by concealed constructions. The width of the gallery over the entrance door is 6 feet 6 inches, and that of the other three galleries is 20 feet 9 inches. Doorways lead from the galleries into a small chapel, the offices of the municipality, and (by the door under the staircase) into a second and a third court. In this last are flowers, orange-trees, and a fountain, above which is seen the small campanile attached to the building. From the second court entrance is obtained to the great council chambers and courts of justice, which are adorned with very pretty coffered ceilings of woodwork, designed in the style *Arabo-Gothique*. Opposite to this building, and in the same plaza de S. Jaime, otherwise called *de la Constitucion*, is the *casa consistorial*, commenced in 1369 and finished in 1378, which possesses a nearly equally beautiful *patio*, but has a façade of an Ionic order, erected in 1832; there is a handsome Doric front towards the garden; the building now contains the municipal archives.

The *aduana* or custom house, 70 feet long and 43 feet wide, looks on to the plaza del Palacio; it has a stuccoed front of two stories, the lower being of a Tuscan order, and the upper one Doric; its erection is said to have been so fraught with vexations as to have caused the death in 1794 of Count Roncali,

who designed this building, and the chapel in the citadel; he also enlarged and modernized the *palacio de la Reina (hala del draps)*. The *casa de lonja* or exchange, a stone building, 266 feet in length and 117 feet in width, facing the *palacio real*, was built about the year 1383, but was altered in 1770 by Juan Soler, who, having succeeded as architect a French artist who had been dismissed by the municipality, was called upon to rectify the faults of his predecessor, and was specially charged to save the ancient great hall, 107 feet long and 70 feet wide, with its semicircular arches on two rows of piers: with these difficulties he produced an exterior, of which the lower story is of the Tuscan order, and the upper one Ionic. A *patio* 55 feet square, in the centre of the building, divides the portion occupied by the chamber of commerce from those appropriated to the tribunals of the municipality and the four gratuitous artistic and other schools founded by the Chamber of Commerce, a list of which, with a view of the building, will be found in the PENNY MAGAZINE for 1843, p. 172. The staircase, which is double with two spacious landing places, is considered a very fine work.

The university, abolished by Philip V, having been revived, the necessary accommodations, designed by Felix Rivas, were commenced on the old foundations in 1841, without making rapid progress. The other scientific and educational establishments, such as the thirteen infant schools, supported by the municipality; the drawing and other schools; the *colegio*; the *seminario conciliar*; the colleges of pharmacy, medicine, and surgery; and the *escolapios*, are chiefly accommodated in the buildings of the suppressed conventual establishments: thus the military school is held in the cloisters (built 1376) of the former monastery of S. Agustin, which was partly destroyed for the citadel. The chief charitable institutions consist of the asylum for infirm priests; the hospital for pilgrims; the school for the blind; the orphan hospital, which the *femal* inmates need never leave; the Magdalen asylum; and the hospital de Sta. Cruz; the military hospital, which receives strangers, and has 700 beds; the *casa de misericordia* for children, with a church, chapel, infirmary, and well lighted workrooms and dormitories, under the charge of the Franciscan nuns; the *convalecencia* or *hospital de S. Pablo*, which with the demerit of having its front wall inlaid with human skulls and bones, is a very large and fine building of its period, with vast wards and a magnificent square cloistered court two stories high, the lower one being arcaded on piers, and the upper one ornamented with columns; the first stone was laid 26 March, 1629, and the building was opened in 1680; and the celebrated *casa de caridad*, which is at once a cheap temporary lodging house, a refuge, a house of detention and reformation, and an asylum for the aged, insane, cripples, etc. The building, although not finished, contains fifteen hundred adult inmates and a school of five hundred children. In this establishment each sex has a church, two large *patios* with fountains, a great lavatory, two kitchens, as many refectories, dormitories, and infirmaries, and a wardrobe. The offices for storing and distributing food and other supplies are very well arranged, and the service to each band of fifty inmates is consequently regular and rapid.

There is also a penitentiary unfinished, with 250 beds; a *casa local de correccion*; a *presidio* for four hundred persons, which is a school of detention and education for juvenile offenders; and the *carcel* or chief prison for 287 persons. This building, begun in 1838 and finished in 1841, is considered unique of its kind in Spain, being an imitation of those in the United States of North America.

Barcelona might be imitated in the general cleanliness of the population, which is provided for by eighteen public fountains and ten public lavatories (wash-houses only); one of these, the *lavadero de la Aduana*, accommodates eight hundred persons at a time, while the *lavadero del Pastur* will hold three hundred in each of its divisions.

The public libraries are accommodated in the church of Sta.

Catalina, in the Franciscan monastery, and in the *seminario*; besides these there are the collections and museums of the Academies of the Natural Sciences and of Polite Literature, of six lesser societies, of the family Salvador, and of two private individuals. The society called the *Liceo Filarmónico-dramático* possesses a theatre, built since 1835, for four thousand persons, which can be emptied in twelve minutes; three arcades in the front open into a handsome vestibule 70 feet long, 55 feet wide, and 21 feet high, leading to three staircases, one upwards and the others downwards, each being 13 feet wide. The theatre itself is 97 feet square, being 3 feet 7 inches larger than that of La Scala at Milan, and of the same shape; it consists of four tiers of boxes without visible supports, above the stalls and rest of the parterre. The first tier has three rows of open seats, the second only one, making in all 1,400 seats, and there are thirty-eight boxes in each tier, making altogether a hundred and sixty-eight boxes, including those in the parterre: each box has to itself an inner room, which leads to the corridors, and is numbered, so that an attendant seated in his box in each corridor watches a dial-plate, and upon any number indicating itself, he dispatches a messenger to the corresponding box for the message, which by means of speaking tubes he transmits to any other part of the building. The space between the pit seats is 33 inches. The proscenium or opening of the stage is 65 feet wide by 60 feet high. A saloon or concert room, two stories in height, occupies 3,900 square feet, and is decorated with ranges of Corinthian columns below and pilasters above: an open gallery leads to the casino or refreshment room at one end of a long gallery, and at the other are the coffee and smoking rooms, which are likewise provided on the other floors, the uppermost range enjoying the advantage of an open terrace. This building, which is in the style of the French Renaissance both within and without, is the first modern building that has been executed in Barcelona in that style, and is reputed to be the best in Spain for arrangement, construction, decoration, scenery, and machinery; and a solitary instance in that country of a modern building so distinguished for its size and convenience.

The theatre of Sta. Cruz was built in 1787 and had a new front in 1846; this is the property of the government, as is also the Teatro Nuevo de Capuchinos built on the site of that monastery in 1843, on a lease for three years. The last named building, which contains 1,600 persons, is of a horseshoe shape, 73 feet long and 47 feet 9 inches wide, with three rows of boxes, an amphitheatre in front, stalls, and pit. Great merit is taken for the introduction of the *letrinas à la Inglesa*. There are also five or six small theatres in private hands. In some of the various casinos, the dancing, card, billiard, and reading rooms are handsomely decorated. The old houses de Gralla and Desplà, now the palace of the marquis of Aitona in the *calle de la puerta Ferrisa*, are worth notice as showing the progress of domestic architecture from the Gothic of 1306 to the latest period of the French and Italian Renaissance, which last are still more beautifully executed in the Casa de Dusay in the *calle del Rigomer*.

Outside the city is a cemetery, which though only about 1,000 feet long by 800 feet wide, and commenced in 1773, was not opened till 1819; it is worth visiting for its catacomb niches, keepers' and priests' houses, and the chapel, with an order imitative of those at Priestum, built by Antonio Ginesi an Italian architect. There is perhaps no city of equal size in Europe which has so many country houses for all classes of inhabitants in its neighbourhood.

The *plaza de Toros* was constructed in 1833 to hold 10,000 persons. The *esplanade de la Ciudadela* and the church of S. Miguel in Barceloneta, designed by colonel Cermeño in 1755, were executed by Damian Rivas. CAPMANY, *Memorias historicas sobre, etc., Barcelona*, 4to., Madrid, 1792. 85.

BARDILLA MARBLE (It. *bardiglio*). A siliceous variety of sulphate of anhydrite, sometimes a clear blue in colour, but generally bluish-grey; it is obtained chiefly from Vulpino in

the Milanese territory. The marble with blue or purple veins obtained from Monte Silvestro, near the quarries of Carrara, is also called *Bardiglio*; both are used in England for chimney-pieces.

W. H.

BARE (Fr. *pureau*, perhaps from *pour eau*). The portion of a slate showing the guage, and on which the water falls. LAP.

BARELLA (AGOSTINO), architect to the senate of Bologna, was engaged in that city upon the Porta delle Lamme and the restoration of the church of the Madonna del Baracano, of which he remodelled the exterior and designed the cupola. He also designed the church of SS. Adelheid and Cajetan at Munich, finished in 1675, except the façade, which was executed by F. de Cuvilliers in 1767. This building was illustrated in three plates, engraved at Paris by Sauvé. 14. 94.

BARETTA (NICCOLO) was in 1766 architect to the government at Bologna, where he designed the church and other buildings of the confraternity of S. Carlo; the parish church of Sta. Margherita; and the portico to the *oratorio* or *scuola* of the Compagnia della Croce; and he rebuilt the parish church of S. Niccolo degli Alberi. 94.

BARETTI (.....), practising at Turin in 1716, was a pupil of Juvara. BARETTI, *Travels*, 4to., London, 1770, ii, 272.

BARGEBOARD, BERGEBBOARD, PARGEBOARD, or more correctly VERGEBBOARD. The board formerly generally used under every barge course projecting beyond the face of a gable, to cover the BARGE COUPLES, or to supply their place. An interesting collection of sketches illustrative of ornament might be formed from the bargeboards to be found not only on domestic buildings, but on the porches of churches, especially in Sussex. The GLOSSARY mentions one instance of their use in the main gable of a church at Sutton in that county. The oldest existing bargeboards, which are those of the fourteenth century, have a "purled aris" consisting of the foiled or cusped ends of tracery which is sometimes double or treble feathered, the spandrels being either foliated as usual or filled with sculpture; sometimes a frieze or band is formed by panelling immediately below the bargecourse and between it and the tracery. In the fifteenth century bargeboards were more used; but although they still were boldly worked they became heavier in effect, and at last were only panelled bands of ornament, trefoils, quatrefoils, etc., with spandrels treated as before. In the sixteenth and seventeenth centuries the bargeboard lost almost all boldness, and became a line of poor foliage and scrollwork, or else a mere architrave of straight plain moldings. PUGIN, *Gothic Ornaments; and Ornamental Gables*, 4to., Lond., 1831. 1. 17.

BARGE COUPLES. This term has been explained in several dictionaries as meaning two beams morticed and tenoned together for the purpose of increasing the strength of a building; whereas they are the rafters (in olden times called *couples* or *couple-closets*) placed under the bargecourse, i. e. projecting tiling, which serve as a ground for the bargeboards, and carry the plastering, if any, of the soffits. In the fifteenth century the barge couples supported a HIP-KNOB, and were generally cut horizontally at the eaves of the gable, where the introduction of pendants is a modern absurdity.

BARGE COURSE, improperly written and called BASH COURSE. The old term among bricklayers for that part of tiling which projected beyond the face of a wall in any building where there was a gable or a KIRKIN-HEAD. Such a bargecourse required barge couples and bargeboards with a THUMB-MOLD. 4.

BARI (the ancient BARETUM, BARIO, BARIUM, or BARUM). The capital of the province called Terra di Bari in the kingdom of Naples. The cathedral, dedicated to the Assumption and S. Sabino, was rebuilt by archbishop John V (1151-1169), but was almost entirely modernized by Muzio di Gacta, who was made archbishop in 1698. It is only remarkable for a tower 263 feet high, and a crypt; the companion tower, commenced in 1617, has remained unfinished. The most important building in the city is the priory church of S. Nicolò and its crypt, commenced by the Normans in 1087. CRAVEN, *Tour*, 4to.,

London, 1821, observes that "the arches which divide the aisles are supported on coupled pillars of granite of different heights. Three several arches stretch across the body of the church; they only reach to the capitals of the pillars, and acquire thereby the unusual appearance of as many bridges." The roofs of the projecting porches in front of the principal doors are supported by pillars, of which the two foremost rest on the backs of animals. The ornamental scrolls and foliage are executed in the Greek manner. GALLY KNIGHT, *Eccles. Arch.*, fol., Lond., 1842, i, 39. The baldachin is an octagonal shrine of marble, added a few years after the completion of the church. The churches and the seventeen conventual establishments, the three great colleges, and as many hospitals, the archbishop's palace, and the theatre, are not buildings of importance.

BARIGIONE (FILIPPO), born at Rome in the year 1690, was a pupil of Mattia de' Rossi, became architect to the Vatican, designed many edifices which were erected in Rome and elsewhere, and died 22 December 1753. 3.

BARIOLE. A marble somewhat similar to that called STE. BAUME, having a confused pattern of strongly contrasted colours, white, red, and yellow, the first being predominant; it is procured from the mouths of the Rhone and is much used in France, where it is considered equal to BROCATELLO. LANGUEDOC MARBLE. W. H.

BAR IRON, also called WROUGHT IRON, but properly MALLEABLE IRON. A name given to infusible or decarbonized iron after it has been made into balls of 56 lbs. or 84 lbs. weight, and placed under a tilt-hammer or passed between rollers, and called No. 1; then cut into lengths of about 18 inches, piled in a furnace, and again submitted to the hammer or rollers and worked into shape. The product is bar-iron called No. 2, which being cut up, heated, and worked again, is called No. 3 or best iron. The sections usually given were round as well as square, from three inches to half an inch in diameter; and rectangular, from six inches wide by an inch thick to an inch and a half by half an inch; but during the last few years the rollers have been formed to produce any desired section.

BARIUM. The metallic base of BARYTA. The sulphuret of barium was employed in Payne's process for rendering wood fireproof, and for the PRESERVATION OF TIMBER, as noted in the CIVIL ENGINEER, etc. *Journal*, xi, 287.

BARKAL or JEBEL BARKAL, properly GIB EL BARKAL, see MOUNT BARKAL.

BARKARY. A tanhouse, or house in which tanners keep bark. It is also used by old writers for a heath house, and for a sheepcote (Fr. *bergerie* or *bercherie*, derived from the late Latin *bercaria* or *berquaria*. 80.

BARKENWERD (WILHELM), living at Utrecht, was appointed *baumeister* to the church of S. Victor at Xanten near Wesel in Rhenish-Prussia, between the years 1488-1490, during which time he was repeatedly consulted as to the works. SCHOLTEN, *Auszuege*, 8vo., Berlin, 1852.

BARK HUT. A resting-place containing a seat in a large garden, and formed of framed timbers covered with unbarked wood and the straight shoots of any tree having a clean bark, as the oak when young, the mountain ash, the black, red, and white birch, the maple, the larch, the yew, and the hazel. "Much of the design consists in the choice and disposal of the planks and pieces so that by its colour it may claim attention, independent of its outline and general proportions. The various sizes of the materials, the colour and texture of the bark when contrasted with the dark brown and yellow hues of the sawn surfaces of the timber, afford ample means for an effective display of taste." PAPWORTH, *Hints on Ornamental Gardening*, Lond., 1819. Several examples of such subjects, said to have been designed by the same author, are given by HOFLAND, *Whiteknights*, fol., Lond., 1821, but are there ascribed to the late Duke of Marlborough, and have been the modern patterns for the majority of such ornamental erections.

BARK STOVE or MOIST STOVE. A greenhouse having ARCH. PUB. SOC.

instead of a stage for flowers, a bed or pit from 2 feet 6 inches to 4 feet deep, to hold bark or other fermenting matter; bark is chiefly used, as it requires the least depth.

BARLETTA or BARLITTA (the Latin BAROLEUM or BAROLIUM). An episcopal city surrounded by walls and towers, situated on the sea-shore in the province called Terra di Bari, in the kingdom of Naples. The wide and well paved streets contain high and tolerably well built stone houses: the buildings of chief importance are the castle of the eleventh century, now in ruins, but formerly one of the three strongest fortresses in Italy; the Lombard cathedral, with antique granite columns and a lofty steeple; several churches, monasteries, and convents; the orphan hospital; the college founded by Ferdinand IV; and the theatre. In the piazza di S. Stefano is a bronze statue about 10 feet high, supposed to represent the emperor Heraclius. A gateway of extraordinary magnificence as to materials and dimensions divides the mole from the town. CRAVEN, *Tour through Naples*, 4to., London, 1821.

BARMKYN or BERMKYN, a corruption of BARBAGAN.

BARN. A building intended for the protection of agricultural produce from the weather. The Roman *nubilarium* seems to have been one or more large sheds or half enclosed barns in which a crop might be dried in bad weather before being threshed; and all well-arranged farms in England formerly had such covered places, which were large enough or numerous enough to contain the whole hay, corn, and straw, produced on them. The GLOSSARY, s. v. GRANGE, mentions seventeen of the fine buildings of the thirteenth to the sixteenth centuries which are found throughout the country, especially in the west of England, called barns, but which might serve as chapels, such as that named the Abbot's Barn in Reading; one at Brockworth near Cheltenham, of very late Perpendicular style; and another at Postlip near Winchcomb in Gloucestershire, of the Tudor period; the coping of one of its gables has the figure of a man standing upright, on the right hand side of its entrance porch or transept is a niche. ARCHÆOLOGICAL INSTITUTE *Journal*, 8vo., Lond., 1849, iv, 104, 99. In consequence of their great width such buildings were often divided into a nave and aisles by posts or pillars, sometimes having arches, but the roof may be said to have always been of a single span. WILLIS, *Descr. of the Sextry Barn at Ely*, 4to., Cambridge, 1843, has illustrated one of the thirteenth century; and LYSONS, *Magna Brit.*, 4to., London, 1806, mentions another at Choley in Berkshire, which was one of the finest that ever existed, being 303 feet long, 54 broad, and 51 feet high. The barn belonging to Canbury House at Kingston-on-Thames was so spacious that twelve carts could unload at once; it had four entrances and as many threshing floors; the roof was supported by pillars. A moderate size for barns was 50 to 60 feet long, 25 to 30 feet wide, and 15 to 20 feet or more to the top of the pole plate. But the improved practice of storing such produce in stacks, ricks, SKELETON BARNs, or DUTCH BARNs, has occasioned the introduction of barns of much smaller dimensions; and their principal use at present is to contain so much as is to be immediately threshed, and a barn may only contain a THRESHING-FLOOR, with room for as much unthreshed corn as is usually put in a single stack, and as much straw; thus the expense of the farm buildings is greatly diminished. W. H.

It was usual to place the large double entrance gates in the middle of each long side of the barn, so that a loaded cart could be drawn into it and unloaded under shelter; and when the width of the barn was insufficient for this purpose among others, the gates were placed in a porch on one or both of the sides, and a lean-to roof prolonging that of the barn was generally brought forward to the line of the porches, to form convenient sheds on each side of them. But as the passage of the loaded carts was found to damage materially the threshing floors, which were commonly placed in the middle of the barn and occupying the whole of its width, many barns are con-

structed without the large gates, and the corn is thrown into the barn through an opening called a *pitch-hole* from the cart outside; when this is the case the floor is placed at one end of the barn and the discharging cart at the other, while the unthreshed corn is deposited between them. As the cart ought to be sheltered during the unloading, there are two modes of planning such a barn, viz. with a passage along the end or along the side; both have their advocates, and perhaps the choice only depends upon the situation of the barn in regard to the road by which it is approached. Some barns are designed with a floor elevated from seven to twelve feet above the ground, so as to give space below into which the threshed corn and straw may fall and where the corn may be winnowed. The requisites for a complete barn are therefore, besides a trackshed for the machinery, if horse-power is used, a place for the cart while unloading, for the corn in straw, for filling the sacks, for the threshing machine, with steps down to the place for the winnowing machine, and from this a communication to the place for making up the straw into bundles. Some barns have two threshing floors, to allow different grains to be threshed at the same time. In North America the barn is used below as a stable, cowhouse, or sheepfold, and above as a granary, etc., a system not approved by English farmers. Barns for maize require open-work floors at every six feet, to prevent the ears from being compressed; barns for hay are generally called *DUTCH BARNs*, and were introduced about the year 1780. The walls of a barn may be built of stone, but brickwork is coming more into favour. The best covering is formed of reed thatching; next is that made of tiles bedded in hay; straw thatching is more objectionable than slate for a barn roof. Numerous louver-boarded and wired openings should be provided in the walls and roof of a barn, and the best site is the northern side of a farmyard, so that any sheds may face the south.

BARNACK RAGSTONE. An oolitic shelly limestone used in the churches of Stamford, Ketton, Colley Weston, and Kettering. Much care is required in the selection of this stone, as parts of the buildings above named are greatly defaced by decay while other portions remain in a perfect state. *Report on Stone for Houses of Parliament*, new edit., 1845.

W. H. BAROCCI or BAROCCIO (GIACOPO), see BAROZZI.

BARODA, formerly called *Chandanavati*, the city of sandal wood, afterwards *Veradavati*, the city of warriors, subsequently *Burpotra*, the leaf of the bur, corrupted into Baroda. The capital of the district of the same name in Guzerat. The city, one of the richest towns of its size in India, is situated on the left bank of the river Viswamitra. It is fortified by a double rampart with round bastions and several double gates, and is divided by two streets placed at right angles to each other. The market-place contains a square Mogul edifice for seats and fountains with three arches on each side; the pagodas of the family of rajah Govind Row and of his minister Rowgee Appagee; the stone bridge, erected during the reign of sultan Ahmed (1411-1443), remarkable as being the only one in Guzerat, and a peculiarly solid construction of three ranges of pointed arcades; and some singular walls with grand flights of steps, are the principal features of interest. The two latter subjects are illustrated by GRINDLAY, *Scenery, etc., of India*, fol., Lond., 1826, iv.

BAR OF A DOOR or WINDOW, see DROP-BAR. LATCH-BAR. SPLIT-BAR. SWING-BAR.

BAR OF A SASH, see BAR.

BAROLITE and **BAROSELENITE**, see BARYTA.

BAROLLI or **BAROOLEE**. A locality about forty miles south-west of Kotah in the territory of Ajmere in Hindostan. It is described by FERGUSON, *Pict. Illustrations*, fol., Lond., 1847, pl. 7, p. 35, as containing "the most perfect group of Hindu temples of their age, and in their own peculiar style perhaps as beautiful as anything in India." They seem to belong to the ninth century of our era, "they may be fifty years more ancient or more modern, but it is not probable." Five

plates of detail are given by TOD, *Rajasthan*, 4to., London, 1829, ii, 704.

BARONE (ANGELO) designed the approach to the church of Sta. Maria Donna Regina at Naples, in the year 1780. 95.

BAROQUE. Until after the year 1770 this French word signified anything of an irregular figure or form; but in 1832 it had attained to such common use as a term of criticism both in French and English as to be described by QUATREMÈRE DE QUINCY as the culmination, or if the term may be allowed, abuse of the BIZARRE. QUATREMÈRE cites BORROMINI as bizarre, and Guarini as baroque. The word baroque involves the idea of anything unintentionally absurd, while the term ROCOCO appears to express a work of architecture in which every license has been intentionally exceeded. 5. 25.

BAROZZI, BAROZZIO, BAROCCI, or BAROCCIO (GIACOPO). A writer on art, LOMAZZO, (*Trattato*, 4to., Milan, 1585) mentions, p. 690 in his list of architectural authorities, "*Jacopo Marazzi detto il Vignola*," following up that name with "*Jacopo Barozzi da Urbino architetto*," and at p. 699 repeats the two names, professing to have seen works written by both artists; a curious statement which requires elucidation, as there is a Monte Baroccio near Urbino, and a Federigo Baroccio, as well as the Zuccaro family of painters (employed at Caprarola), came from Urbino. LOMAZZO in a subsequent work, *Idea del Tempio*, 8vo., Bologna, cites "*Barozzi detto il Campagnolo pittore ed architetto*."

BAROZZI, according to VASARI and DANTI, BAROCCI, according to GINORI (GIACOPO, GIACOPO, or GIACOPO), was born 1 October 1507 at Vignola (according to the usual authorities), in the territory of Modena in Italy, whence he has been called *da Vignola* and *il Vignola* by the Italians, but VIGNOLA simply by the other European nations. He was the son of Clemente, a Milanese citizen, who had been forced to live in seclusion at Vignola, and who died, while the child was very young, leaving him to the care of a mother (the daughter of a German soldier), by whom he was placed at Bologna to study the art of painting during his childhood and in his youth; but he did not greatly profit by the instruction, partly because he was not put at first in a right direction, and partly because, as evinced in the few paintings which he executed, he was more decidedly disposed to the study of perspective and architecture, inasmuch that he not only acquired the first principles almost without assistance, but mastered the greatest difficulties connected with them in a very short time; many architectural drawings made by him before he had become celebrated, principally for Messer Francisco Guicciardini, who was then governor of Bologna, and his friends, were executed in intarsiatura, by the Dominican Fra Damiano da Bergamo. Having subsequently proceeded to Rome, intending to study painting, in the hope of obtaining the means of assisting his poor family, Barozzi made drawings at the Belvidere for Jacopo Melighini of Ferrara, architect to Paul III (pope from 1534 to 1550). There was then in Rome a society of nobles and gentlemen, who met for the purpose of reading Vitruvius, and by these—among whom were Marcello Cervini (afterwards Pope Marcellus II), Monsignore Maffei, Alessandro Manzoni, and others—Barozzi was subsequently employed to take measurements of all the Roman antiquities, and to execute other works under their direction. The Bolognese painter, Francisco Primaticcio, had meanwhile arrived in Rome, and by him also Barozzi was much employed in procuring models of a great part of the Roman sculptures. These preparations completed, Primaticcio returned to France, taking Barozzi with him, and employed him in architectural works, as well as in the casting of the statues above mentioned, all of which Barozzi carried out with diligence and judgment. VASARI fixes 1540 as the year of Primaticcio's journey to Rome, whereas 1537 is commonly given as the time of Barozzi's accompanying him to France, which did not happen, according to VASARI, until after the death of Il Rosso in 1541. DANTI states that Barozzi made designs for

a palace not executed, and various other drawings, particularly the perspective backgrounds for the pictures by Primaticcio at Fontainebleau.

Two years later he returned to Bologna (in fulfilment of a promise to the count Filippo Pepoli), to conduct the works at the fabric of San Petronio. There he consumed several years in disputes with his competitors, without having anything done, with the exception of the canal which was constructed after his designs, to enable vessels that previously could not come within three miles of Bologna to enter the city. VASARI seems to be wrong in asserting that Barozzi executed nothing but this canal called the Naviglio, at Bologna, for DANTI fixes his then sojourn there as the period at which he executed in that city the additions to the portico dei Banchi; a house for Achille Bocchio (built in 1545, and now called the casa Pielli, MALVASIA), according to the taste of his client; and a palazzo for count Alamanno Isolano at Minerbio near the city. The only work existing in 1849 belonging to this palazzo, is an octangular columbajo or dovecote about 25 feet in diameter and 70 feet high, calculated to hold about thirteen thousand pigeons. (ANGELL, *Life, etc., of Vignola*, read at the Royal Institute of British Architects, 4 February 1850.) Some of these works however might have been executed during his visit to the city in 1562, such as the Portico dei Banchi, a building 300 feet in length, which forms in the piazza maggiore a sort of wing to S. Petronio. The architect had to preserve the old portico which was very low, two streets, and an immense number of small windows which looked into that square. In the original design were two small towers rising from the arches which cross the street; but these were not executed.

Not receiving an adequate reward for his exertions as to the canal, and displeased at the successful opposition of his rivals, especially Giacomo Rainucci, to the execution of his designs (two drawings preserved in the church for the façade of S. Petronio, one of which is of a Gothic character in accordance with the other parts of the building, were pronounced by the judges, Giulio Pippi and Cristoforo Lombardo, to be the best submitted), Barozzi withdrew to Piacenza and designed the palace there (now nearly destroyed) for Pier Luigi Farnese, who was father of the cardinals Ranuccio and Alessandro Farnese, created duke of Parma and Piacenza in 1545, and died in 1547. The five-ailed church of S. Agostino at Piacenza, with a nave supported by thirty-four monolithic granite Doric columns, lately desecrated, and the Palazzo di S. Giorgio dei Scotti outside that city, are also attributed to this architect, who left the erection of the ducal palace from his working drawings to the care of his son Giacinto, and returned to Rome under the patronage of the two cardinals, according to LETAROUILLY, *Edifices de Rome*, fol., Paris, 1840, who gives in plates 134 and 135, details for doorways and chimney-pieces designed by Barozzi in the Palazzo Farnese at Rome; and in a note, p. 312 of the text, states that the work must date during the period between the deaths of San Gallo (1546), and that of pope Paul III (1550). LETAROUILLY also corrects the legendary authorship of the first floor of the cortile (pp. 271, 305, 310), but attributes to Barozzi part of the honour of the great cornice (pl. 121, p. 290; pl. 115, p. 274), the continuation of the back front of the palace (pl. 124, pp. 295, 319), a ceiling (pl. 139, p. 318), the Caracci gallery (pl. 117, p. 280; pl. 137, p. 314), two fountains (p. 277), and some other works for this family as hereafter mentioned.

In 1550 Julius III, who had been legate at Bologna, was elected pope, when Barozzi by the intervention of Vasari was appointed architect to his holiness, from whom he received the charge of the Acqua Virgine and of all the works at the *vigna* of the pope, according to VASARI, but in the *villa* of the pope (a thousand feet distant from the *vigna*), according to LETAROUILLY, 423-428. Before commencing anything the pope obtained from Vasari drawings which were altered at various times according to his caprices, and afterwards considered and

corrected by M. A. Buonarroti; and then Barozzi from those drawings designed many apartments, halls, and other ornaments, as VASARI twice states, "*finì con molti suoi disegni le stanze sale e altri ornamenti di quel luogo.*" LETAROUILLY, 423-428, treats this statement of matters with contempt, saying that as Barozzi was charged with the execution, all the front part, that is to say the casino or dwelling, was entirely his work, except perhaps the window (said to have been a design by Buonarroti) on the first floor in the middle of the curved façade of the cortile. The great court may have been commenced and the rear buildings executed by Barozzi as far as the middle of the second vestibule, for Ammanato is said to have inscribed his own name on one of the pillars to show where his labours commenced (LETAROUILLY, pl. 205-221, p. 435-470). A medal of pope Julius III shows that Barozzi intended to have erected a small cupola at each end of the semicircular court, but these features do not exist. Before quitting this work Barozzi constructed for the same pope the small neighbouring church of S. Andrea Apostolo da Ponte Molle (LETAROUILLY, pl. 199-201, p. 421-435), and perhaps also some fountains and small garden buildings in the grounds of the villa. GINORI observes that Barozzi commenced the Palazzo Giulio in the Via Flaminia, with the lower story of a Corinthian order and the upper one Ionic; this was completed under pope Pius IV and afterwards became the *casino della Reverenda Camera*. At the request of pope Julius, Barozzi redecored the dwelling rooms in the palazzo of the pope's family (the Dei Monti) in the Campo Marzio, which afterwards belonged to the grand duke of Tuscany, whence it is called the Palazzo di Firenze; executed therein that façade of the cortile on which the armorial ensigns of Julius III are sculptured (FOLCHI, *Il portico detto del Vignola*, etc., fol., Rome, 1848), and commenced for the same family a palazzo looking towards that called *della Famiglia* or *dei Cortigiani* belonging to the Borghesi. About the same time he is supposed to have executed the nymphæum or fountain with its doorway and windows of a rusticated order, in the cortile of the Palazzo dei Caffarelli; the palace itself was built by his pupil Gregorio Canonica.

The date of the death of Julius III (1555) might indicate the end of these engagements, but that event would not interfere with the continuation under Marcellus II and Paul IV (1555-1559) of the construction of the celebrated villa for the cardinal Alessandro Farnese at Caprarola near Viterbo, on foundations laid by Antonio da Sangallo (ROSSI, *Studio d'Architettura*, fol., Rom., 1702-21; LE BAS and DEBRET, *Œuvres complètes de Vignole*, fol., Paris, 1815 (which was being decorated in 1560); the palazzino or casino in its grounds is attributed to Barozzi by PERCIER and FONTAINE, *Choix des plus célèbres maisons de plaisance*, fol., Paris, 1824. It appears that he about this time made designs for a chapel in the church of S. Francesco at Perugia and for buildings at Castiglione del Lago and at Castello della Pieve for Ascanio della Cornia; and that he revisited Bologna in 1562 for the erection of the Arcigninasio, commonly called the *Scuole* or *Studio*, generally attributed to Terribilia; and designed the fountain in the Piazza della Rocca at Viterbo, as well as the villa Lante near that city. On the death of Buonarroti, Barozzi and Pirro Ligorio were elected his successors as architects to S. Peter's, with injunctions from pope Pius IV not in any way to alter the design made by Buonarroti; Ligorio however having disobeyed these commands was dismissed by pope Pius V, and Barozzi remained sole architect until his death. Perhaps no other part but the lateral cupolas was designed by him. He was also nominated architect to the pope, and is said to have been employed at the Vatican; he also enjoyed the same position in regard to the city of Rome, and continued the Porta del Popolo begun by Buonarroti. Some writers contend that only the front towards the Via Flaminia is by Barozzi, and that towards the city by Buonarroti; while LETAROUILLY, pl. 4, p. 150, hesitates to receive as his designs the two porticos similar to each other on the

Campidoglio, one leading to the convent of Sta. Maria in Ara Celi, and the one opposite to Monte Caprino; and being commissioned by the cardinal chancellor Alessandro Farnese, he executed a doorway on the left hand in the first floor of the palazzo called the Cancellaria (LETAROUILLY, pl. 87, p. 228; D'AVILER, p. 124, says it was never executed), which has sometimes been confounded with another also designed by him for the same cardinal Alessandro for the church of S. Lorenzo in Damaso (LETAROUILLY, pl. 80, 83, 85, 87, p. 221-229). Besides these works he designed about the same time the tomb of cardinal Ranuccio Farnese (ob. 13 Dec., 1565), otherwise called the cardinal di S. Angelo, in the church of S. Giovanni Laterano (LETAROUILLY, p. 485), and the chapel of abbot Riccio in the church of Sta. Caterina dei Funari at Rome: the ground floor of the church itself may have been his design. According to MILIZIA the church called Del Gesù, 216 feet long and 115 feet wide (LETAROUILLY, pl. 198, p. 419), was commenced in 1568 by cardinal Alessandro Farnese, who carried it up to the cornice on the designs of Barozzi; it was finished in 1575 under his pupil Giacomo della Porta, who executed the portal, vaulting, dome, chapels, and altar.

This was about the last great work executed by Barozzi, but numerous others which cannot be dated are attributed to him; such are a church at Sant' Oreste, another at Manzano (ANGELL), Marzano, or Mazzano (MILIZIA), perhaps Nazzano, near Sant' Oreste; that of Sta. Anna dei Palafrenieri di Nostro Signore in Borgo Pio, carried out by his son; and the Oratorio di SS. Crocifisso di S. Marcello, both at Rome; a chapel in the church of S. Francisco at Perugia; and the church of Sta. Maria degli Angeli at Assisi, 370 feet long and 180 feet wide inside the walls, the first stone of which was laid 25 March 1569: this building was continued by Alessi and afterwards by Vicenzio Danti. The convent of Sta. Maria in Ara Celi at Rome was restored in 1582 (?) from designs by Barozzi and finished by G. della Porta. Amongst the palazzi attributed to him are that of the Mattei in the Piazzetta di S. Valentino; Torres (not Nari) at one end of the Piazza Navona and near the Palazzo Alttempo (LETAROUILLY, pl. 37-39, p. 176); Caponi; Spada in the Via di Capo di Ferro (LETAROUILLY, pl. 26, p. 167); Sciarra ("was built in 1603 by Flaminio Ponzio with a marble Doric doorway attributed to Barozzi," MURRAY); and Fontana, all at Rome; a loggia in the villa Montedragone, and part of the decorations in the gardens belonging to the Borghese family at Frascati; the gateway to the Orti Farnesiani at Rome (DONALDSON, *Doorways from Modern Buildings*, 4to., Lond., 1836); and portions of the Villa d'Este at Tivoli, especially the central loggia of the garden front (ANGELL). According to WARNER, *Excursions*, 8vo., Bath, 1801, p. 273, the manor house of Keston, Kelston, or Kilweston, the seat of the ancient family of Sir John Harrington, Bart., near Bath, Somersetshire, was built in 1587 from the design of James Barozzi an architect of Vignola; the courtyard now only remains.

Barozzi was asked to examine and advise upon the twenty-two designs for the Escorial, procured in Italy by the Baron Martirano, and is said to have selected the best parts of each and to have composed one which was so acceptable to the Spanish monarch as to gain him an invitation to Spain; this was declined by him on account of his age, his health, and his duties at S. Peter's. In the year 1573 Barozzi was despatched by pope Gregory XIII to Città di Castello to examine into a question of boundary between the Tuscan and the Papal States, when although suffering from indisposition at the time he not only fulfilled the commission with care and judgment, but designed the Palazzo Bufalini in that city (MURRAY). Upon recovering his health he returned to Rome and reported to the pope upon the subject of his mission and upon the state of the buildings being executed from his designs, and received further directions; but during the night he was attacked by fever, and died after six days' illness on the 7th July 1573, aged 66. He had requested to be buried in a private manner, but his son

Giacinto being obliged to yield to the wishes of the public, he was interred in the church of Sta. Maria della Rotonda (the Pantheon), the members of the Academy of S. Luke attending the ceremony.

VASARI, *Vite*, 4to., Rome, 1568, published five years before the death of Barozzi, says—"the many works which he has written and published, or is now writing;" but only two literary productions by him are known; one treatise, *Le due Regole della Prospettiva Pratica*, fol., Rome, 1583, was published after his death, his son Giacinto having placed the rough manuscript in the hands of Ignazio Danti, who prefixed a memoir, it went through many editions in Rome, Bologna, Venice, and elsewhere. Bibliographers are not able to decide upon the real date (probably 1563) of the first appearance of his work upon the orders entitled *Regole delle Cinque Ordini d'Architettura*, consisting of thirty-two plates inclusive of the engraved title-page and preface: the last of these plates gives the famous *corruzione* which was so often imitated, and which according to the researches of SPAMPANI and ANTONINI, *Il Vignola Illustrato*, fol., Rome, 1770, was executed in the front of the old palazzo Bonelli, in the piazza dei SS. Apostoli, commenced by cardinal Alessandro Farnese. The edition of his treatise on the orders, by AMATI, fol., Milan, 1805, has but one additional plate, that of the doorway to the church of S. Lorenzo in Damaso, but most of the other editions (Venice, 1603, 1648; Rome, 1610, 1617, 1702; Amsterdam, 1617, 1631, 1642; Siena, 1635; Paris, 1736, 1750; Lisbon, 1787; London, 1655, 1669, 1694, 1697, 1729, 1703; Milan, 1814) have a sort of appendix frequently entitled *Aggiunta delle Porte dell'Architettura di M. A. Buonarroti*, etc., inclusive of several designs presumed to be by Barozzi, preceding those by Buonarroti. The translation by MOXON is also remarkable for some additional plates. The edition, or rather paraphrase, by D'AVILER, which has gone through almost as many editions as the original, also contains the plates of this appendix.

Among minor features in his practice which assisted to create his fame, may be cited his door and window dressings, which have been pronounced unrivalled, his treatment of rustications, and his invention of the scale of a module and parts of a module. His decision in the dispute between Bassi and Tibaldi is deservedly considered a golden precept, "le fabbriche non hanno da sostenersi colle stringhe", which may be translated that "buildings ought not to have to sustain themselves with bandages". His work on the Orders has been adopted as a textbook in France, although severely criticised by Milizia, and is as synonymous in that country with Italian architecture, as the treatises of Palladio and Chambers are in England. MALVASIA, *Le Pitture di Bologna*, 12mo., Bologna, 1766; MURRAY, *Handbooks*; DEZALLIER D'ARGENVILLE, *Vies des Architectes*, 8vo., Paris, 1788.

BAROZZI (GIACINTO, HYACINTH, or JACINTO), superintended the works of the ducal palace at Piacenza, and of the church de' Palafrenieri di Nostro Signore in Borgo Pio at Rome, up to its cornice; and gave by letter dated from Sermoneta, 4 January 1580, the manuscript of his father's work on Perspective to Fra Ignazio Danti, by whom it was commented upon and published in 1583.

BAR-POSTS. The posts fixed in the ground between which moveable rails are placed, by slipping them into mortises, thus forming a gate without showing that one exists. 1.

BARRACK (It. *baracca*; Sp. *cuartel*; Fr. and Ger. *caserne*). This word in Spanish originally meant such a small cabin as was built on the seacoast by fishermen, consisting of four forked poles fixed upright for the corners, and carrying four others as plates for the roof, the covering and the sides being made of planks, thatch, wattles, or turf. Temporary sheds of this sort were called barracks when used by cavalry, and huts when occupied by the infantry in a camp, the officers only having tents. The word is now applied in a more enlarged sense to the permanent buildings specially constructed for the residence





of a regiment of soldiers, or (as in Ireland) a division of police. Such buildings, though previously common on the continent, were not introduced into England before the year 1720 (*Common Sense Journal*, London, 1739, cv), and few were erected until 1792, when barracks were ordered throughout Great Britain, which were built at a cost of about four million pounds before 1805; the same sum was spent upon similar buildings in the following quarter of a century.

Barracks for a single infantry regiment generally contain a small infirmary or hospital, with a deadhouse and surgeon's rooms; the men's guard-room with four cells and two black-holes; the officers' guard-room and its orderly room, with pay-master's sitting-room and bed-room attached; the colonel's sitting and bed-rooms; the adjutant's office, with two sitting-rooms, a dressing-room, bed-room, servants' room, and kitchen; the officers' quarters and large mess-room, lavatory, and reading-room (some regiments have been allowed to add billiard and other rooms, coach-houses, stables, etc., at their own expense); the quarter-master's, the barrack-master's and the barrack-serjeant's apartments and stores; two large armouries with bays for accoutrements, and a smith's shop with forge; two powder magazines; about thirteen serjeants' sitting-rooms, their general mess-room, and five bed-rooms; five drummers' sitting-rooms; general mess-room, band-room, yard and practising shed, besides the day-rooms, dormitories, refectories (mess-rooms), two kitchens and larders, with all the necessary stores, out-houses, and other accommodations, including a canteen. For a cavalry regiment, stables, a riding house, farrier's shop, and other such accessories are added.

Specifications, detail drawings, and estimates of quantities of barracks chiefly of iron for hot climates, are given in the *Papers connected with the Duties of the Corps of Royal Engineers*, 4to., London, ii, 233. *Barrack Accounts of Expenditure for Building*, ordered to be printed by the House of Commons, 3 July 1820; and various *Reports of Commissioners of Military Inquiry*, etc.

BARRACK ROOM. The term applied during the eighteenth century to that large apartment fitted up with numerous beds which was one of the requisites of any country house the owner of which, exercising the hospitality of the time, recognized the impropriety of allowing his guests to depart before daylight. The name is now sometimes given to the chamber in which several beds for male servants are placed. W. H.

BARREAU (GABRIEL) was engaged upon the first additions to the palais Bourbon, now the Chamber of Deputies at Paris, after L'Assurance and before Charpentier. *LEGRAND and LANDON, Description*, 8vo., Paris, 1808.

BARREL DRAIN. A drain made in the form of a hollow cylinder. *DRAIN*.

BARRELING. A term used by some architectural writers for the arched section so formed that no water may lay upon it, which is given to the portion of a road appropriated to carriages: a precaution which is as observable at Pompeii as in the best of the English turnpike roads. *HOGGING*.

BARREL ROOF. The name improperly given to a semi-circular vault forming the ceiling of a hall or other large room. This is one of the principal features of all important vaulted Romanesque buildings of every country.

BARRESA or BARRETA (JUAN) is mentioned as the architect who commenced the construction of the upper or Ionic gallery of the cloister in the monastery of S. Miguel de los Reyes at Valencia in the year 1580; Covarrubias and Vidana designed the whole edifice. 66.

BARRIER. The term, equivalent to the Latin *septum*, for an erection of posts and bars sometimes filled in with open or solid work, to prevent the too near approach of a crowd of persons to any point. Such barriers appear to have been erected in various portions of the ancient temples and basilicas: *VITRUVIUS*, iv, 4. In one of the temples at Rhamnus (*INED. ANT.*) the holes in the pavement and shafts of the columns clearly in-

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dicate the former existence of a barrier. *ITAR* and *JENKINS* also found traces in the Parthenon and the Theseum at Athens of such barriers, which probably resembled those seen in the paintings and bas-reliefs at Pompeii. The word barrier is also used for a barricade placed at the end of a street; tables or other obstacles to a crowd in front of a railway counter; and a fence forming the *passage de queue*, introduced about the year 1845 into some English theatres, in consequence of its acknowledged utility in continental buildings in breaking the rush of a crowd entering such places.

BARRIGIONI, see *BARIGIONI* (FILIPPO).

BARRIOS (.), a Spanish architect, designed the palace built in the royal chase of Persano between Salerno and Paestum; and a fort near the palace at Portici, both in the kingdom of Naples. 28.

BARROW. The common term for a TUMULUS or large mound of earth raised in early ages over the body of a distinguished personage.

BARROW. The general name for any kind of carriage moved by the hand only; see *HAND-BARROW*, *WATER-BARROW*, *WHEEL-BARROW*.

BARSTONE. The term applied to an upright stone placed on each side in a fireplace (before the invention of grates) to receive the ends of the bars; it was also called *CATSTONE*. *DOG*.

BARTH. A warm shed or nursery in a farm-yard for calves, lambs, and other young beasts.

BARTHOLOMEO succeeded as *baumeister* in 1468 to the office of conducting the works of the tower of the cathedral (*Domthurm*) at Frankfort-on-Maine. 92.

BARTHOLOMEW (ALFRED), born 28 March 1801, was a pupil of Mr. J. H. Good, sen. Besides various fugitive papers, he published *Hints relative to the Construction of Fire-Proof Buildings—and on the failure to produce sound and estimable Architecture by the means at present usually adopted*, 8vo., London, 1839; and *Specifications for Practical Architecture, accompanied by an essay on the Decline of Excellence in the Structure of Modern English Buildings*, 8vo., London, 1840. The Finsbury Savings Bank, in Safford Street, is given in the *CIVIL ENGINEER*, etc., *Journal* for 1840, p. 217. His design for rebuilding Kentish Town Chapel, described in the same work for 1842, was not executed. His private practice did not afford works of sufficient importance for further notice. In 1844 he became the editor of the *BUILDER Journal* (iii, 29), and had been appointed district surveyor for Hornsey but a few weeks when he died, 2 January 1845.

BARTIZAN. A small and generally circular turret corbelled out from the wall of a building: this is a feature of constant recurrence in Scottish architecture, recalling the larger *tourrelle* of the French builders, and is even found attached to churches. Many examples are given by *BILLINGS, The Baronial, etc., Antig. of Scotland*, 4to., Edinb., 1845-52.

BARTOLETTI (. . . .) designed a bridge at Pisa, in competition against Silvani; his proposal of a single arch was accepted, and he completed the work in two years; it stood for a week to the delight of the Pisans, who felt a tremendous shock in the course of the eighth night, and found the next morning that their bridge had not been even a nine days' wonder. 3.

BARTOLO (NANNI DI), called also Rosso, was an architect and sculptor, who executed various works at Florence about the year 1400, in conjunction with Giovanni di Ambrogio and his son Lorenzo. 5.

BARTOLOMEO (DIONISIO DI), supposed to have been a pupil of Giam Battista Cavagni, built the house with the two cloisters of the Padri dell' Oratorio called the Gelormini at Naples, which was commenced in 1586 and finished in 1597. He also designed and built their church between 1592 and 1619, with the exception of the cupola and façade, which were finished by Dionisio Lazzaro, who also much altered the dwellings and cloisters. 36. 95.

BARTOLOMEO was employed about the year 1404 to design the large window of the ducal palace at Venice in the side fronting the mole; to execute (1423-1429) the seventh and following columns, counting from the same side, on the front facing towards the piazzetta di S. Marco; and about 1429 to design the principal door called the *porta della carta* in the same façade, which bears the inscription, "opus Bartholomaei". 28.

BARTON, sometimes written BARKEN and BERTON. This term was used in the southern and western counties for any very large farm not in the hands of the owner of the manor, for the farm-house on such land, for the farm-buildings and outhouses, and for the yard of the house, as well as of the farm-buildings. HALLIWELL, *Dict.*, 8vo., London, 1850, s. v., observes that in the Unton inventories pigs are mentioned as being kept in a barton. The word clearly meant originally the farm-buildings collectively, but has been restricted in general use, during the last century at least, to an enclosed place in which poultry is kept.

BARYTA, often written BARYTES and BAROTE. The protoxide of barium, which when exposed to the air attracts moisture, and when water is poured on it exhibits the same appearance as lime when slacking, but the process is more rapid and the evolution of heat greater. It is soluble in 20 parts of cold or 10 of hot water, and renders the syrup of violets green, and the infusion of turmeric red. It is poisonous, and occurs native in two combinations, both called "heavy spar": one of these, called barolite, or witherite, is found abundantly in the lead veins that traverse the secondary limestones of Cumberland and Durham, and at Anglesark in Lancashire, it contains 80 per cent. of baryta and 20 per cent. of carbonic acid; this is carbonate of baryta; a variety, called barytocalcite, contains 34 per cent. of carbonate of lime: the other combination, called baroselenite or barytine, but cawk in Derbyshire, where it is found, as well as in Cumberland, Westmoreland, Montgomeryshire, and Shropshire, contains 66 per cent. of baryta and 34 per cent. of sulphuric acid; this is the sulphate of baryta. It occurs both massive and crystallized, but generally foliated, and when pure is white and translucent, but it is often coloured by the sulphates of lime and strontian. It is sometimes traversed by veins of pitch stone, which gives the barytes a deep yellow tinge. It is found as a marble in the valley of the Loire in France, and is used for table tops, for enriched moldings, and for tessellated pavements. The lightest tinted varieties are ground and used as a pigment, or rather as an adulteration of white lead as a pigment; whence, in consequence of the strong affinity of barium for sulphuric acid, much oil paint acquires a darkish grey or bronze tint. A variety of barytine, called barytostromianite or stromnite, from being found at Stromness in the island of Pomona, consists of 70 per cent. of carbonate of strontian, with sulphate of baryta, a little carbonate of lime and oxide of iron, and is found massive, being of a greyish colour externally, but internally of a yellowish-white. W. H.

The ATHENÆUM and CIVIL ENGINEER *Journals* of 1844 contain a notice of this sulphate of barytes, being a beautiful water-colour pigment called *constant* or *permanent white*, "known to mix with most colours without altering their properties, indestructible, uninfluenced by damp, foul air, time, or light, and seeming to be a substance, both from its durability and extreme beauty, peculiarly fitted for house decorations when the vehicle is not oil"; but the manufacturers of Chinese white, an oxide of zinc, confidently contradict these recommendations, for muriate and nitrate of baryta are tests of the presence of sulphuric acid.

BASALT. A variety of common trap-rock, composed of felspar and augite, with some iron, lime, manganese, soda, and magnesia. It is of different colours, according to the prevalence of these ingredients: thus it is found black with small shining black spots; black with large white crystals in the

shape of pomegranates; black with red granitic bands; blackish grey with small pomegranate-shaped crystals and little black spots; blackish grey with small white veins and scales; *flowery black*, as it is called, marbled with white and irregularly wavy; bluish grey with a glimmering lustre; greyish black with small white points, which is called *oriental* and *occidental* basalt, according to its quality, the occidental being the softest; greyish black with very small grains of white quartz and spots of iron ochre; greyish black interspersed with black siderite, partly amorphous and partly crystallized, and with greyish white felspar, which gives the general tone of colour; greenish black with black siderite, grains of white quartz, and transparent felspar; greenish black with crystallized black siderite and small square prisms of yellowish green olivine (the last named crystals decompose); green with small white crystals, which is very rare; and reddish brown, the colour being produced by the decomposition of the iron. Touch-stone basalt or *pietra di paragone* is properly *basanite*.

Several dykes, and the circus in the island of Mull (Hebrides), with horizontally ranged prisms, are among the most extraordinary resemblances to building assumed by basalt in cooling. But the globular, the amygdaloidal, the annular, and BASALTIN or the columnar basalts, are all rare in comparison with the vast quantities in which massive basalt occurs.

Although employed both for buildings and statues by the Egyptians until nearly the end of the dominion of the Roman emperors, under whom it was called *lapis Æthiopiæ*, it is now no longer used for such purposes (except in some places as paving) on account of its extreme hardness: it is said to form, when calcined and pulverized, an excellent substitute for pozzuolana, and to have the property of setting under water. W. H.

BASALTIN, or BASALTIC HORNBLENDE. A variety of hornblende, which is black, dark green, or yellowish green in colour, according to the prevalence of the silica, alumina, iron, lime, manganese, soda, and magnesia, which it contains. This name is given to crystallized basalt, sometimes called columnar basalt, seen in the Giant's Causeway in Ireland, and at Fingal's Cave in the island of Staffa (Hebrides). This structure is probably produced, during the change of the fluid mass by refrigeration into a stony substance, by the enlargement of a spherical crystallization until the globules are pressed against each other, horizontally becoming converted into polygonal (chiefly hexagonal) prisms seldom exceeding two feet in diameter, and vertically divided into unequal lengths jointed at the edge by a lap or rise, whilst the upper portion is convex, seated upon a concave bed. W. H.

BASE COURT (Fr. *basse cour*). In the old mansions this name was applied to the inferior court-yard, whether preceding, as at Versailles, the principal quadrangle or *cour d'honneur*, or placed behind the principal building, as in many of the English Tudor edifices; even in earlier times it was placed behind the great hall. At present the term expresses the court attached to the side or back entrance of a house, appropriated to tradespeople and servants, and generally surrounded by domestic offices; in some villas it denotes the yard for favourite specimens of domestic animals. The term should never be employed either for the kitchen-yard or the stable-yard, although sometimes indiscriminately thus applied.

BASEL (PETER VON) was in 1332 *baumeister* at the cathedral of Freiburg in Breisgau. 92.

BASE LINE. A term in Perspective, signifying a line representing the intersection of the vertical plane of the picture with the plane of the ground on which the picture is assumed to stand.

In Surveying, it means a line, as long as possible, from which angles are constituted, offsets are taken, and levels are checked. Although from its importance it requires to be laid down with great care, it is frequently only driven roughly, which proceeding is one of the sources of the many errors which prevent the satisfactory tie of a plan from the field book. W. H.

BASEMENT. The wall of the ground story, or of part of that story, treated as a distinctive substructure in any façade where the main order or other principal portion of the design stands over it, and hence the term has been used collectively to express the rooms of such ground floor. In ordinary houses, however, the ground floor loses this appellation, which is given to any lower floor wholly or in part underground.

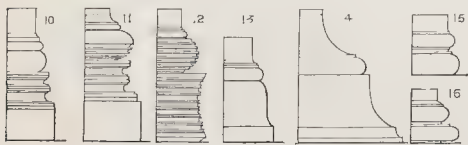
BASE MOLDINGS. In ancient classic art, as well as in modern architecture, this term is applied indiscriminately to the moldings at the base of a column, an anta, a pilaster, an attic, a pedestal, a pillar, or a wall. In mediæval architecture, however, the term is now applied with much greater latitude, not only to the moldings round the bottom of the shaft or shafts of a pillar, but to the collection of plinths, moldings, and plain or panelled bands, which form the decoration of a wall next to the ground, which is frequently too elaborate to be expressed by the terms FOOTSTALL or BASETABLET.

BASE OF A COLUMN. The foot applied to the column in the classic orders, excepting generally the Doric, to which however, as well as to their Tuscan order, the architects of the Italian schools have appropriated a base, although they did not find any in the antique Roman examples of the theatre of Marcellus and the baths of Diocletian, and did not follow that of the lowest order of the Coliseum. By general consent the fillets at the top and bottom of the shaft are considered as belonging to it and not to the base. Beyond the remark that in many cases a large circular plinth serves as a sort of base to Egyptian columns, there is little to detain attention from the fact laid down by VITRUVIUS, iii, 3, that the ancients recognized only two kinds of bases, the ATTICURGIC or Corinthian, and the IONIC.

The fillet, 1, at the bottom of the Doric order seen at Albano not being considered therefore as a base, and no example of a mere plinth occurring to the writer, the most simple molded base appears to be composed of a torus and plinth, like that of the pseudo-Doric columns to Trajan and to Antonine at Rome; the former of which seems to have been adopted as the origin of their Tuscan bases by Palladio, Scamozzi, Serlio, and Barozzi. This, with the addition of an astragal, forms the Doric base, 2, of Barozzi, and was employed for the massive composed order in the second palace at Persepolis; 3, from the composed order at Pæstum; 4, from the Doric order of the Coliseum; 5, from



the single Corinthian column at Bassæ; 6, from the Ionic order to a tomb at Antiphellus; 7, another belonging to a tomb at Telmessus, are all steps in composition directly leading to the Ionic base described by VITRUVIUS and found in Asia Minor, distinguished by the existence of a single torus placed at the upper portion of the base, as seen in the Ionic order of Barozzi, 8. This remarkable instance of his skill is less enriched than that used in the temple to Apollo Didymæus, 9, at Miletus, which may serve as a standard of the Ionic base; 10, from the

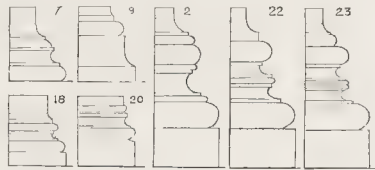


temple to Jupiter at Aizani, would be identical in composition with 11, employed in the temple to Minerva Polias at Priene, if its torus were decorated with flutes and fillets. The fragment

ARCH. PUB. SOC.

of a base found near the tomb of Cyrus at Pasargada is curious, as the apophyge ends on the astragal. The fluting of the torus in these two last instances is also found in two examples at Athens and one at Eleusis, which otherwise exhibit the attic or atticurgic base, with little variation. 12 is the base from the temple of Juno at Samos.

The introduction of a large inverted cyma between the torus and plinths of the massive composed order employed at Persepolis as above mentioned, forms the base 13, of the lighter order at the same place; closely allied to which are 14, from the Ionic order at Bassæ, and 19, from a tomb at Myra: 15, from the Ionic order used in another tomb at Myra, like its companion in design, 16, from the Corinthian order of the temple to Vesta at Tivoli, has no plinth; 17, is from the



Corinthian order in the choragic monument of Lysicrates at Athens.

The attic base, 18, has been employed by Palladio, Scamozzi, Viola, and De l'Orme, for their Doric orders, and by universal modern consent it has been applied to the Doric, Ionic, Composite, and Corinthian orders, although separate bases for each have been invented, as hereafter mentioned. It is employed for the Ionic order at the Erechtheum, where the upper torus is ornamented with a guilloche instead of the flutes which are introduced in other bases in the same building. The lower torus to the semi-columns of the Erechtheum is the smallest, and the scotia the largest of the three members, like those two features of the Ilissus temple; in almost all the Greek and Asiatic examples of this base the fillet or astragal, under the upper torus, has nearly the same projection as the torus itself, while in the interior of the Propylæa at Eleusis the profile of the common atticurgic base is preserved. The bases of the *Ionic* orders employed in a tomb at Telmessus; in the colonnade near the lantern of Demosthenes at Athens (STUART, iii, 40); in the inner vestibule of the ruins at Eleusis; in the second order of the Coliseum, in the theatre of Marcellus, in the baths of Diocletian, and in the temple to Fortuna Virilis, at Rome, are all examples of the atticurgic base; which is also seen used for the *Corinthian* order in the temples to Vesta, to Antoninus and Faustina, and to Mars Ultor, and in the frontispiece of Nero at Rome; in the temple to Jupiter Olympius, and in the arch of Hadrian at Athens; as well as in the building called the Incantada at Thessalonica; and for a *Composed* order in the theatre at Myra, in the baths of Diocletian at Rome, and in the vestibule at Eleusis.

TEXIER, *Arménie*, pl. 67, gives 20 as the Pseudo-Doric base at Kangovar, but the profile has been differently described: the Ionic orders of the temple of Minerva Polias at Priene, the (destroyed) temple on the Ilissus at Athens, and the temple at Aphrodisias, exhibit the Vitruvian atticurgic base, 18, with the addition of an astragal between the bottom fillet of the shaft and the upper torus; which is also employed in the basilica of Antonine at Rome, in the Ionic orders of Palladio and Scamozzi; in the Corinthian orders of the theatres at Aizani, of the arch of Constantine at Rome, of the peribolus at Aphrodisias, and of the aqueduct of Hadrian at Athens; and in the *Composed* orders of the Augusteum at Ancyra, and of a temple at Patara. The addition of another astragal over the lower torus produces the base of the Composite order of Scamozzi; the introduction of another under the upper torus gives 21, that of the Corinthian order of the last named author and of Palladio; 22 is used by Barozzi for his Composite order; and with two astragals instead

of one between the scotias, it is the Ionic base of Alberti and Serlio; is the Corinthian base employed at the temple to Jupiter Tonans and the Pantheon at Rome, as well as at the arch to Trajan at Ancona, and by Barozzi, Serlio, and Alberti; and is the Composite base used in the arch of Titus at Rome.

The Corinthian base of the temple to Jupiter Stator at Rome, which is used by Palladio for his Composite order, is the same as the last described base, with the addition of an astragal over the upper torus as 23.

The base to a Composite order in the baptistery called S. Giovanni in fonte at Rome, is the same as that of the Composite order of Barozzi, 22, with the addition, between the shaft of the column and the upper torus, of a large molding ornamented with acanthus leaves, which is supposed to have been introduced in order to make good the length wanted in the shaft. LETAROUILLY, *Edifices*, 4to., Paris, 1840, p. 511.

Although not immediately a portion of the subject, it is desirable here to notice the channel worked in the pavement round the bases of Doric and Ionic orders, not only in the propylea of Athens and Eleusis, but in many other examples of Grecian architecture. *Inedited Antiquities*, ii, pl. 1 and 14. A similar channel is worked on the top of the upper torus of the base in the temple of Minerva Polias at Priene, the arches of Titus and Septimius Severus, and the baths of Diocletian at Rome. One explanation given for all these channels is that the works were never finished.

BASE OF AN ANTA AND OF A PILASTER. The bases of these portions of Greek architectural decoration of the Doric order have frequently the same profile as the **BASE-MOLDINGS** of the wall to which they are attached: those of the Ionic order are generally only variations from the bases of the columns of the edifice to which they belong. In Roman and Italian architecture the base of the pilaster is precisely similar to that of the column of the order employed.

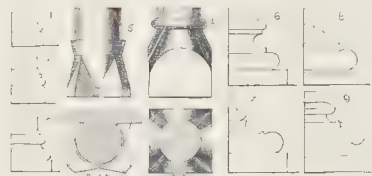
BASE OF AN ATTIC. As moldings in this position are generally returned round the pilasters, if any, formed in the attic, reference must be made to the above notice on the base of a pilaster. In many antique examples, however, the attic has been executed with the cornice and **BASE OF A PEDESTAL**; and in modern architecture the attic has received moldings suitable to the **BASE OF A WALL**, and distinct from the bases of such pilasters as may have been employed.

BASE OF A PEDESTAL. The various orders composed by the different Italian masters have almost uniformly been considered by them as necessarily combined in some cases with pedestals, and they have consequently designed a **PEDESTAL** with its cornice and base suitable to the character which they intended to exhibit in each order. Besides using similar pedestals for the support of statues, etc., modern artists have employed piers of various plans having also cornices and bases, but often exceeding those of the Italian masters as much in the richness of their composition, as they have fallen short in other instances, especially since the commencement of the present century, and been reduced to the mechanical simplicity of a mere plinth, sometimes not even chamfered. The pedestals used by the mediæval artists constantly exhibit richness without loss of simplicity, the capital and base respectively presenting the characteristic features of a string course and **BASE OF A PILLAR** contemporaneous in style.

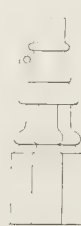
BASE OF A PIER OR PILLAR. Having considered the composition of the ornamental foot of a column, it is easy to conceive that somewhat similar might be traceable in the progress of the mediæval junction of the shaft or verge of a pillar, as it is called by WILLIS, *Nomenclature*, 4to., Camb., 1844, with the ground. Piers seem to have been treated almost precisely as the pillars. According to many writers the mediæval plinth is a part of the base proper, and is considered by them so indispensable as to cause the general term base to include even the **FOOTSTALL** as it is called by others.

The bases seen in some Byzantine edifices recall the idea of

the classic apophyge, as that at Ani, 2, while others at the same place, 1 and 3, although correctly freed (**BASE OF A COLUMN**) from this tradition, still exhibit a fillet next to the shaft. Some examples of Norman and Early English bases may be adduced, in which the plinth, as a decided feature, is absent, its place being supplied by a step or tablet; but these are exceptions to the rule of a massive plinth, as at the church of S. Cross in Hampshire, square on plan, with foliage or other ornament connecting the spandrels of its top with the bold roll molding (sometimes with an astragal above, sometimes with a hollow below it), which divides the plinth from the shaft. But the Norman period is perhaps most decidedly distinguished from succeeding epochs by the Byzantine character of bases such as that at Haddiscoe in Norfolk, 4, which rather resembles an inverted capital like that at Dhigour in Armenia, 5, than the molded bases from Canterbury, 6, and Peterborough, 7, of the period immediately preceding that of the first Pointed Gothic. The affinity of these with the pure Atticurgic base has been so carefully illustrated by PALEY, *Manual*, 8vo., Lond., 1845, that it is unnecessary to do more than refer to that work for the steps by which, after



imitating the scotia of the antique base less in a vertical position than in a horizontal direction (so as to be contracted in height while cut so deeply that it has been suggested this form was adopted with the intention of its holding oil to prevent insects from reaching the shafts), as exhibited in fig. 9, which contains the elements of most First Pointed bases, the mediæval architects, after numerous variations, inclusive of the addition of another torus as at Polebrooke in Northamptonshire, and at Lincoln cathedral, arrived at the Decorated profile, 8, from Rievaulx Abbey. In the Norman and First Pointed styles the lowest torus rarely projects before the plinth, and the footstall generally finishes at top by a plain or hollow chamfer, to which a molding is sometimes added. But in the Second Pointed bases almost as many examples may be found in which the true plinth has less projection than the lower molding of the base, whether that be an upright or an inverted scroll molding, a roll, or a roll and fillet, as in instances where that lower molding does not project beyond the plinth. The most usual bases of the Second Pointed style have three connected roll moldings with a recessed plinth; and when the upper two were melted as it were into a **WAVE-MOLDING**, as in the chapter house at Wells cathedral, the first step of the Transition to the Perpen-



dicular or Third Pointed bases became visible: indeed the later Decorated and the early Perpendicular bases seem interchangeable, as observed by PALEY, who agrees with WILLIS in considering it possible that the common Third Pointed base, 10 (from Eltham palace), may be referred to the Atticurgic base above mentioned. The occurrence of an astragal at the end of the shaft is an almost unailing mark of a Perpendicular base. The profile of the English base of this type is as commonly seen in the French style *ogival tertiaire*, *fleuri*, or *flamboyant*, as that of the Atticurgic base above mentioned is in the previous styles.

BASE OF A WALL. The ornamental junction of the exterior or interior of a wall with the ground or floor. There has been as much diversity of design in this mode of decoration as in the bases of columns and pedestals: the classic architects differed in their practice, for the Romans introduced the surbase and dado, while the Greeks generally used the same finish to

their walls as to their *antæ*, for where the one has not even a plain plinth, the other has no base of any sort. At the temple to Nemesis at Rhamnus the *antæ* ends with a sunk face, 1, which is returned and continued along the walls. At the temple to Apollo Epicurius at Phigalia, or Bassæ, and at the large temple at Paestum, there is a simple plinth; the Tower of the Winds at Athens has a torus and a fillet in addition; the temple to Theseus at Athens, and the Propylæa at Eleusis, have a reversed ogce; the temple to Diana Propylæa at Eleusis, and the temple to Minerva at Sunium, 2, have a detached astragal in addition. The Propylæa at Eleusis, 3, and the temple to Jupiter Olympius at Athens, 4, exhibit the reversed cyma, whilst a section from Eleusis, 5, shows some additional moldings.

Rich examples in which the *ATTICURGIC* BASE is more or less



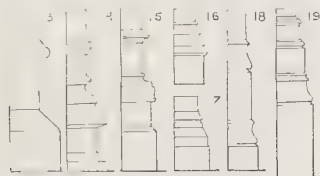
varied are seen at the monument to Agrippa, 6, and the base-ment under the statues of the Pandroseum, 7, with the continuations, used externally and internally, of the bases of the *antæ* and pilasters at the temple to Minerva Polias or the



Erechtheum, all at Athens, 8; but perhaps the best antique specimens of this kind of decoration are those in which the Ionic base was chiefly followed, as at the temple, now destroyed, near the Ilissus at Athens, 9, and in the temple to Nemesis at Rhamnus, 10. The

Roman architects extended the number of moldings employed in the composition of bases for pedestals and walls, of which good instances exist in the arch to Titus at Rome, 11 and 12.

In the mediæval styles the wall plane was joined to the ground plane by a GRASS TABLE with a plain or hollowed chamfer, or a molding; there were frequently one or more plinths with their appropriate chamfers, or else there were bands with tables having suits of moldings, between this grass table and the general face of the wall, or between it and the bases of piers and pillars. The illustrations are from the churches at Bourton in Warwickshire, 13 (First Pointed); at Ewerby in Lincolnshire, 14 (Second Pointed); and at Ryhall in Rutlandshire, 15 (Third Pointed). When such bases are interrupted by openings, they are generally stopped and returned upon the wall. The bases of buttresses are usually treated in the same manner as the walls, but are sometimes made more important by the introduction of additional moldings or wider bands.



In the *style ogivale primaire* of France, the triple set-off, 16, carried round the walls and buttresses of the choir to the church called the *Abbaye aux Hommes* at Caen, forms such a grand base-molding as is rarely if ever seen in contemporaneous English buildings, except at Salisbury. The ducal palace at Caen has a complete base and plinth, 17, of the second period (?); bases belonging to the *style ogivale tertiare* may be seen at the church of S. Ouen, 18, and the Hôtel de Bourgtheroulde at Rouen, 19.

Among the finest mediæval bases are those at Henry VII's chapel in Westminster, with one plain and two ornamented

bands; that at Yelvertoft in Northamptonshire (RICKMAN, *Attempt*, 8vo., London, 1848, p. 213) has four ornamented bands; but the largest and grandest mediæval combination of base moldings is probably that designed by Giotto in 1334 for the campanile of Sta. Maria del Fiore at Florence (*Illustrations*, pl. 7). The architects of the Renaissance and of modern times, have usually, in accordance with a peculiarly Roman practice, treated the bases of walls in the same manner as those of pedestals; but for many years the English architects have omitted what would be the surbase of the pedestal: internally this custom has been extended from simple chambers to the most magnificent saloons, which, within the last twenty years, frequently have had no other SKIRTING than a plain or double faced plinth with one or two moldings, not more altogether than a foot in height, but now the revulsion of fashion not only demands bases of eighteen inches and more in height for rooms of ordinary dimensions, but is adopting afresh the use of the surbase.

BASEVI (GEORGE), JUNIOR, F.R.I.B.A., F.R.S., F.S.A., the younger son of George Basevi, Esq., was born in London April 1st, 1794. He received his education in Dr. Burney's school at Greenwich, and there evinced an early taste for drawing. He became a pupil of Sir John Soane in 1811; in 1816 he made a professional tour through Italy and Greece, exhibiting artistic talents to an extent greater than usual at that period; returning to England in 1819, he was able to enter at once upon the practice of his profession, fortunately not being one of those architects who, though ultimately successful, have had to struggle through a long period of obscurity and neglect. Thus he was appointed surveyor to the Guardian Assurance Company upon its formation in 1821; and about the same time he was engaged in the erection of S. Thomas's church at Stockport, S. Mary's at Greenwich, and a house for David Ricardo, Esq., in Gloucestershire. Both of these churches are in the Roman style of architecture, and were opened for divine service at the latter end of 1825. At this date he was employed by Messrs. W. and G. Haldimand in forming plans for Belgrave Square, London. Between the years 1825 and 1840 he designed and superintended the erection of the houses in that square, except those at the angles. In 1829 Basevi was appointed surveyor to the trustees of Smith's Charity estate in Chelsea, and also to the adjoining estate of Mr. Alexander. In consequence of the above appointments, he was employed on the erection of S. Saviour's church, and also of S. Jude's, both in the same locality, and in the Gothic style of architecture; Pelham Crescent, Sydney Place, part of Brompton Crescent; Thurloe Square, etc.

In 1826 he designed additions to Baliol College, Oxford, but certain schisms in that university led to the late A. W. Pugin being also applied to. Neither of them, however, was employed. In 1831 and 1833 he built Dr. Fryer's Alms-houses, and Truesdale Hospital, both at Stamford, Lincolnshire. In 1833 he submitted a model and plan for a new House of Commons, on the occasion of his examination on this subject before a Committee of the House of Commons. In 1834 he considerably enlarged the buildings of Middlesex Hospital in London. In 1835 he was successful in a competition for the Fitzwilliam Museum at Cambridge, and in 1836 that building was commenced. As the interior remained unfinished at the period of his death, Mr. C. R. Cockerell, R.A., was commissioned to complete it; he however adhered generally to the original intentions of Basevi. CIVIL ENGINEER, etc., *Journal*, ix, 129, 361. During the progress of this last named important work, Basevi was engaged on Trinity church and national schools at Twickenham, Middlesex (1840-1); on the restoration of Hove church, near Brighton, Sussex; on the erection of S. Mary's Hall in that town; of a house of correction at Wisbeach; and additions to the gaol at Ely, both in Cambridgeshire.

In the erection of the Conservative Club House, S. James's Street, London, the latest important work on which he was

engaged, he was associated with Mr. Sydney Smirke, A.R.A.: this building was commenced in 1843, and completed in 1845. The exterior was the joint design of those gentlemen; but of the interior decorations the ground floor was exclusively finished from Basevi's designs, and the first floor from those of Mr. Smirke. CIVIL ENGINEER, vii, 43, and BUILDER *Journals*, iii, 229.

In the spring of the last mentioned year these same architects were jointly appointed by the Carlton Club in Pall Mall, London, to rebuild their premises; but Basevi did not live to share the labours, for on the 16th Oct. 1845, whilst making a hasty inspection of the upper part of the western bell tower of Ely cathedral, his foot slipped, and falling through an aperture in the floor, he was killed on the spot. His remains were interred in Bishop Alcock's chapel, at the east end of the cathedral.

Besides the works above named, Basevi enjoyed a considerable private practice, and was employed more or less extensively on the mansions of John Ivatt Briscoe, Esq., at Foxhills, near Chertsey; of the Rev. P. Curtois, at Longhills, near Lincoln; of Sampson Ricardo, Esq., at Titness Park, Sunning Hill, Windsor; of Capt. Phillimore, at Newberries, Hertfordshire; of Capel Cure, Esq., at Blake Hall, Essex; of Stewart Majoribanks, Esq., near Watford, Hertfordshire; of W. Haldimand, Esq., at Ashgrove, in Kent; of W. H. Hyett, Esq., Painswick House, Painswick, Gloucestershire; of T. W. Beaumont, Esq., at Bretton Park, Wakefield, Yorkshire, and at his town residence in Piccadilly; of the Marquis of Thomond, at Taplow House, Maidenhead, Berkshire; of W. Mackworth Praed, Esq., at Teignmouth, Devonshire; and of R. Bray, Esq., at Shere, Surrey.

S. S.

BASH COURSE is improperly written for BARGE COURSE.

BASHENOV, BASCHENOV, or BAJENOV, see BAZHENOV.

BASIL or BESIL (Fr. *biseau*; Ger. *bahn*). The chamfered side at the cutting end of such a tool as a chisel. In working soft wood, joiners use a basil inclining twelve degrees; but if a hard wood is being worked, they employ a tool in which the basil slopes one-half less, *i. e.* eighteen degrees: a joiner's chisel has one basil, which is inclined to the parallel planes of the iron; a mason's chisel may be said to have two basils.

BASIL, BASILL, or BASYL (SIMON) was comptroller of the royal works in 1601, and surveyor to the king's works at his decease in October 1615, when he was succeeded by Inigo Jones; SHAKESPEARE SOCIETY, *Inigo Jones*, 8vo., Lond., 1848, pp. 17, 18, 47, 48. The HARLEIAN MS. in Mus. Brit., No. 1857, fol. 18 a, gives the amount of salary to the surveyor and other officers in the year 1610, when Basil received £36:10:0 per annum, with allowances.

BASILIA. The late Latin name for BASLE in Switzerland.

BASILICA. This word, which has been applied to buildings appropriated to very different purposes, is derived from the Greek adjective *basilikos*, royal, pointing to a supposed original application of it, viz. to the building or apartment wherein the tribunal was held at which the king presided in person; and which, corresponding somewhat in name and early use to the English court of King's Bench, was necessarily attached to the royal palace. If this opinion were correct, the term might afterwards be applied to any building appropriated as a court of justice; and in this sense the term basilica was certainly used, viz. to signify the place where the court was covered, in opposition to the *agora* or forum, where the auditory must chiefly have been in the open air. The judgment-hall of the second acroion at Athens is called *σβαί βασιλικός* by DEMOSTHENES, *Cont. Aristog.*, and by PAUSANIAS, *Descr.*, i, 3; and in the same manner as the Roman courts of justice are called by Greek writers *σβαί* or *σβαί βασιλικός*, so the porticus of Pompey and that of Æmilius Paulus are respectively called *regia* by STATIUS, *Silv.*, i, 30, and by SUTONIUS, *Aug.*, 31. The edifice at

Pæstum, which has nine columns at each end, is considered by QUATREMÈRE DE QUINCY, *Dict. s. v.*, to be a Greek basilica.

On account of the following passage in VITRUVIUS, v, 1, "it is desirable that the sites of basilicæ attached to the fora should be fixed in the warmest places, that men of business may assemble therein during winter without annoyance from the weather", it has been supposed that most of such edifices, and all of the most ancient ones, were open on the sides to the external air, *i. e.* enclosed with columns only; in such cases there would have been little if any difference between a porticus and a basilica: yet CAPITOLINUS, in *Gord.*, 32, mentions "the Prænestine villa of the Gordians having two hundred columns in tetrastyle order, in which were three centenary basilicæ"; this word centenary must be understood, not to mean a hundred feet in length, as it is generally translated, but a hundred columns, fifty on each side of the basilica or aisle. VITRUVIUS, vi, 8, enumerates a basilica, as magnificent as those of public places, among the requisites of the dwelling of an influential man, because crowds then knew where to assemble to hear him discuss the affairs of the commonwealth, and decide upon pleadings in matters referred to his arbitration: the basilica in the ruins called villa of Lucullus at Posilippo may be an example in point. Even a private building for such purposes would require to have a portion reserved for the leading speakers; and such a portion would be still more necessary in a public basilica, where the decisions given by the centumviri (QUINTIL. xii, 5, PLINY, *Ep.*, ii, 14, vi, 33) and by the tribunes of the people (PLUTARCH, in v. *Caton. Min.*) were pronounced.

The plan of all known or supposed basilicas is rectangular, and VITRUVIUS prescribes that "their width should not be less than a third, nor more than one half, of their length, unless the nature of the site should interfere, and compel an alteration of the symmetry. But if the site should be larger in length, then CHALCIDICA may be arranged at the ends, as in the basilica Julia." The place for the tribunal might therefore either be taken out of the area of the building, or be a projecting apse; in either case the chalcidicum could only belong to an enclosed building. The first arrangement would be the one adopted, when the basilica was simply used as a hall of justice; but if the public ever asserted and exercised the power of using the basilica as an exchange as well as an ambulatory, the apse might become necessary, in order to prevent confusion in the body of the building from interrupting the proceedings before the magistrates. Each half of the semicircular apse was called *cornu*; the seats or *subsellia* which it contained afforded places in which persons of distinction could be sufficiently near the judge to express, even in their countenances, satisfaction or disapprobation: TACITUS, i, 75; PLINY, *Ep.*, ii, 14. When there were aisles, the nave, *media porticus*, was separated from them by piers with or without columns, or by columns alone. VITRUVIUS also observes that the columns are to be made as high as the porticos are wide: each portico or aisle is to be made one-third of the future middle portion or nave in width: the upper columns are to be one quarter shorter than the lower ones. It seems best that the pedestal, *pluteus*, which will be between the upper and lower columns, should be made also a fourth part less than the upper columns, so that those who are walking on the framed ceiling timbers of the basilica might not be seen by the negotiators within. The same author gives a description of the basilica designed and executed by himself at Fanum, in the course of which he intimates that the entrance was on one side, and that the tribunal was opposite to it; and that the nave was formed by columns of the whole height of the building, differing therein from the rule previously laid down by himself. SCHAYES, *Histoire*, etc., i, 85, observes that "archæologists are not agreed as to whether the nave and aisles in the large basilicæ were of equal height, as at the basilica Sessoriana, now the chiesa della Sta. Croce at Rome,

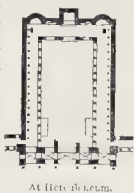


AT PÆSTUM



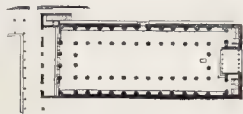


or whether the nave rose above the side roofs." Men who frequented the gallery occupied one side and females the other (PLINY, *Ep.*, vi, 33). The staircase which led to the gallery is supposed to have been generally on the outside, as at the basilica in Pompeii, and at that of Constantine, presumed to have been built by Maxentius, in Rome; but there is no reason why the staircase in large buildings should not have been within the walls. The entrance vestibule was remarkable for little depth, according to those who have given the plans of the remains at Rome, Pompeii, and Herculaneum.



The principal remains of basilicas at Rome are, as above mentioned, the basilica Trajani or Ulpia, of which a plan is given by GAILHABAUD, *Monumens*, 4to., Paris, 1852, pl. 43, showing a hemicycle at one end only and five aisles; BUNSEN suggests that there were two, as the entrances are at the sides: it is described by BURGESS, *Topography*, 8vo., London, 1831, who also gives a plan of the presumed basilica of Constantine, commonly called the temple of Peace, which has a hemicycle at one end and one side, the latter being of later date than the original building. The same author's work and papers above cited may be consulted, not only as to this basilica, but as to the two edifices called Æmilia, if the first basilica Æmilia were situated near the church of S. Adriano, and the basilica Julia, or as above suggested Julia Æmilia, near the church of Sta. Maria della Consolazione; one of which is represented on the remains of the marble plan preserved in the Capitol at Rome.

About twenty such edifices are named by PRISCUS, *Lexicon* s. v., as having been built in Rome at different periods; but except the parts which belonged to those of Trajan and Constantine, there is little left of these magnificent works in that city. The example at Pompeii is in better preservation; the walls, ranges of Ionic columns, and the tribunal, being



At Pompeii.



At Otricoli.

still visible; at Pompeii there appear to have been dungeons below the basilica; that discovered in 1777 at Otricoli, and described by GUATTANI, *Mon. Antichi Ined.*, 4to., Rome, 1784, and in the Roman *Notizie sulle Antichità e Belle Arti*, is as remarkable for the remains of fluted Corinthian columns, hemicycle, decorations, and general arrangement of its plan. The basilicas of least importance, as those at Præneste and at Palmyra, and sometimes the larger edifices, consisted of a nave only; such is the case at the basilica erected by Constantine at Trèves, and formerly called the palace of that emperor, which is worthy of particular attention; it is about 239 feet 6 inches long, 98 feet 6 inches wide, and 104 feet high to the roof; the walls are 10 feet 3 inches thick, built of brick, and are pierced with two ranges of windows; the marble pavement rests on a



At Trèves.

hypocaust; SCHMIDT, *Baudenkmale*, fol., Trier, 1845. A basilica with curious accompaniments, at Pergamus, is mentioned by TEXIER, *Descr. de l'Asie Mineure*, fol., Paris, 1839, ii, pl. 116-119.

The subject of the early Greek and Roman basilicae has been carefully treated by ZESTERMANN, *De Basilicis*, 4to., Brussels, 1847, who devotes one book to the Greek and another to the Roman buildings of this class; notices ruins at Albano, Palestrina, Nîmes, and Trèves, as so far destroyed as not to justify their restoration in plans such as those with which he illustrates his description of examples at Herculaneum, Otricoli,

Pæstum, Pompeii, and Palmyra; and expresses his opposition to the generally received opinion that the basilicas were usually terminated with a large niche or absis. Like several other writers, he forms a class of modern basilicas, such as the *sale* at Brescia, Padua, and Vicenza.

14. **BASILICA, AS A CHURCH.** The disputed question as to the origin of the application of the term basilica to a Christian church, as stated by BONA, *Rer. Liturg.*, i, 19, seems to have been conclusively treated by BURGESS (*Paper* read at the Royal Institute of British Architects, 27 June 1853), in the following terms: "Before the conversion of Constantine, the followers of Jesus were not permitted to erect buildings for the celebration of their worship; they performed their rites in the dark recesses of the catacombs, or in private houses. The Christians did sometimes obtain, by special favour, the use of some building of no external appearance; but they were not permitted to extend the dimensions, nor effect any imitation of the temples of the gods. Alexander Severus granted a sort of tavern 'for the Christian superstition', the Taberna Meritoria, in the Transtiberine district; the basilica of Sta. Maria in Trastevere, one of the seven of Rome, was erected upon the site, and is said to have been the first public edifice erected at Rome. It was no doubt under Constantine that this was effected, when the protection of the law was extended to Christianity." Then probably some of the ancient basilicas, as the Septimia, the Sessoriana, the Sinciniana, the Æmilia, with that in the Lateran, and others, or their materials, were used by the Christians; and it may easily be imagined that the new builders would prefer a model which not only afforded the plan most suited to the Christian ritual, but also one which in size and magnificence could worthily compete with the temples of the discarded superstition, even if they had not had the use of the existing constructions, which "not only preserved the original name, but transmitted it to all other churches built upon a similar model" (BURGESS, *Topography*, 8vo., London, 1831, i, 292): and once a basilica, the church has retained the title, however much it may have lost, as at S. Peter's, the original form. According to some writers, the churches of S. Giovanni in Laterano, S. Pietro, S. Paolo fuori le Mura, and Sta. Maria Maggiore, were the only really ancient basilican churches in Rome; but others add those dedicated to S. Sebastiano fuori le Mura, Sta. Croce in Gerusalemme, and S. Lorenzo fuori le Mura; while some authors add those of Sta. Prassede, Sta. Maria in Trastevere, Sta. Agnese, Sta. Maria in Cosmedin, S. Clemente, and SS. Nereo ed Achilleo. The church of Sta. Maria Maggiore is peculiarly interesting, as showing a space for the *pluteus* of VITRUVIUS, and having an upper range of pilasters; that of S. Lorenzo fuori le Mura has no apse, the orientation has been changed, the church has received many additions, and the triforium is only apparently one as it has no floor; that of S. Giovanni in Laterano, also called the basilica Constantini or basilica Aurea, has now a vestry behind the apse.

D'AGINCOURT, *Hist.*, fol., London, 1847 (Arch., pl. 72), has given a list of churches really basilican, such as those of S. Spirito at Ravenna, supposed to date from the third century (FABRI, *Sagre Memorie*, 4to., Venice, 1664, BELTRAMI, *Il Forastiere*, 8vo., Ravenna, 1783); of S. Chrysogono in Trastevere at Rome, said to have been founded by Constantine; and of Sta. Agata Maggiore at Ravenna, 398-418; the cathedral at

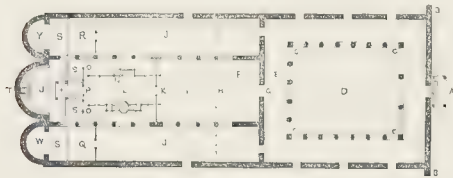


Basilica at Parenzo

Parenzo in Istria, built in 542, which church is preceded by an atrium, an octagonal baptistery, and a tower; the churches of S. Apollinare in Classe at Ravenna, 549 (FABRI; BELTRAMI, p. 219; CIAMPINI, *Vet. Mon.*, ii, 11); of SS. Nereo ed

Achilleo at Rome (seventh century); of S. Giovanni in Borgo at Pavia (seventh or eighth century); of S. Pietro in Vincoli at Rome (eighth century); of S. Zenone at Verona (tenth or eleventh century); and of SS. Apostoli at Florence, as well as the cathedral at Modena, both belonging to the twelfth century. Churches exhibiting the Latin cross in plan are however of much earlier date than these last examples; such an arrangement being fully developed in the church of S. Michele at Rimini, which is one of the most ancient instances of a cross church. RAMÉE, *Hist. de l'Architecture*, 12mo., Paris, 1843, gives sketches of the plans, with an account of the changes of the names and arrangements, of the leading churches of this class at Rome. Many early churches, sometimes called basilican, have a marked transeptal arrangement internally at the sanctuary, as those of S. Vincenzo alle tre Fontane, Sta. Maria sopra Minerva, S. Agostino, Sta. Prassede, and Sta. Maria in Araceli, with numerous others at Rome.

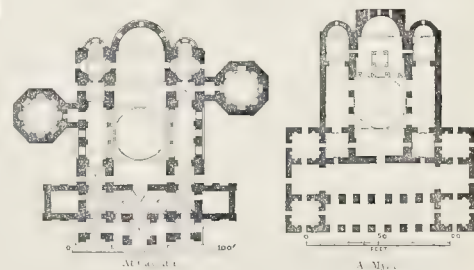
The accompanying illustration of the arrangements and accessories of a basilican church, founded on those of S. Clemente (passing the question of ORIENTATION), shows the wall or *peribolus*, B B, enclosing the whole circumference of the outward courts, and marking the boundary of the sanctuary, or more properly asylum. The porch or anteportico, A, the *vestibulum*, *propylon*, or *prothyron*, also termed the first entrance, was sometimes, as still is the case in that of the church of S. Clemente, prepared for shelter by curtains. Between the front wall, B B, and the church was a large area, C C, or *parvise*, *paradisus*, which is called by EUSEBIUS *aithron*, and by PAULUS SILENTIARIUS *aule*; but by the Latins ATRIUM and IMPLUVIUM, being a court without any covering except upon the sides. A cloister, E, *stoa*, sometimes surrounded the atrium, and was built upon columns, whence it was called *quadriporticus*, and *tetrapylon*. ISIDORUS, *Orig.*, xv, 3, mentions that an atrium had



an external cloister or portico on the three *exposed* sides, which observation has led to some confusion; when only three porticoes existed in the atrium or aule, the cloister would be called, as he notices, *triporticus*. EUSEBIUS, *Hist. Eccles.*, x, 4, mentions "wooden latticework carried up to a reasonable height between the columns": and his commentator VALESIIUS assumes as the reason for this latticework, that the atrium was planted as a garden: otherwise there were in the courtyard one or more fountains, tanks, or basins of water, D, to which many names have been given, as *chrene*, *columbeion*, *embates*, *phiale*, *phrear*, *cantharus*, *labrum*, and *NYMPHÆUM*, as well as *LEONTAKIUM*. It is stated that the faithful generally were interred in the courtyard or garden, *pratellum*, sometimes in vaults or crypts, as at that of Sta. Prassede, while the more distinguished members of the congregation were buried in the cloister or portico, as at the church of S. Ambrogio at Milan. For many years after graves were allowed in the cities of Italy, they were still kept out of that which was strictly and properly called the church; the Council of Nantes (A.D. 658) saying in the sixth canon "in ecclesia nullatenus sepeliuntur, sed in atrio aut portico aut in exedris ecclesie". Pilgrims were sometimes lodged either under the porticoes themselves, or in habitations such as those for the inferior ministrants which opened into the cloister.

Where there was no atrium, the main building might be preceded either by a lobby, E, forming a continuous porticoes, sometimes with a porch under it as in the church of SS. Achilleo ed Nereo, by porches sheltering an entrance to each longitudinal

division of the church, or by a single porch opening into a species of narrow lobby, F, extending the whole width of the edifice, its interior partition having the necessary doors, as at the church of Sta. Maria in Cosmedin. Either lobby is called NARTHEX by SUICER, *Thes. Eccles.* s. v.; and by DUFRESNE, *Com. in Paul. Silent.* ESONARTHEX, EXONARTHEX. MORINUS, *Com. Hist.*, fol., Paris, 1651, vi, 1, states that the church itself was early divided into only two parts, the *aula* or *atrium laicorum*, and the *sacrarium*; and also insists that the eastern monks did not use the threefold nomenclature of *hierateion*, *naos*, and *narthex*, till the beginning of the sixth century; the THEODOSIAN CODE mentions the *thusaisterion* or sanctuary, S, the four-square *eucterion* or oratory of the people, I, and the remaining portion, F (to which it gives no name) from that to the door of the church. If the narthex was not a mere internal barrier, the central gate was higher and wider than those on either side. The aisles, J, *embolus* or *circuitus*, separated from the nave by pillars, or by columns intermixed with piers, as in the church of Sta. Maria in Cosmedin at Rome, or by piers only, were appropriated to the division of the sexes; the males taking the left hand side on entering, according to an inscription given by ARINGHI, *Roma Subterranea*, 2, x, 23, "which does not hinder the women from having their apartment on that side too, if the same custom was at Rome which was at Constantinople and other Greek churches, which was for the men to sit below, and the women in porticoes or galleries above them", as observed by BINGHAM, viii, 5, who gives no authority for the latter part of his opinion that "some are a little too curious in fixing this women's part always precisely to the north, or right side of the church; for though this might be the custom of the western churches in later ages" . . . "yet it appears to have been otherwise anciently in many of the Greek churches". BINGHAM, viii, 5. The galleries were called *hyperoa*, and *catechumena*, or *catechumena*, and were used by females, and for other purposes; thus the Council of Constantinople (1165) sat in the right hand gallery of the church of S. Alexius. The *matroneum*, R, and *senatorium*, Q, are terms generally understood to mean the portions of the aisles nearest to the bema, and respectively appropriated to the reception of distinguished persons according to their sex. On the side walls below as well as above were *cubicula* or oratories; PAULINUS, *Ep.*, xii, *ad Sever.*; and these chambers, which were also considered to be part of the *catechumena*, were sometimes used as lodgings. BINGHAM, viii, 5. A considerable difference between the Latin and Greek basilicas is contained in the observation that the ceilings are no longer flat, but vaulted and domed in the



Greek churches, which also have north and south doors. The Latin basilicas did not generally have doors in their side walls; those at the church of S. Giorgio in Velabro at Rome are due to the Greek pope Zachary (745). In that portion of the building called the *naos* or temple, and *navis* or nave, sometimes called *eucterion* or oratory, I, of the people, there was placed the AMBO or BEMA of the readers (*ἀναγινώσκων*), as it is called by SOZOMEN, viii, 5, or *pulpitum*, and *tribunal ecclesie*, as it is termed by CYPRIAN, *Ep.*, 33 and 34, or 38 and 39; which is on the south side and opposite to the paschal candle in the church of SS. Nereo ed Achilleo, which has an east

front: the *SOLEION*, *o*, is explained as the *presbyterium*, *senatorium*, or magistrate's throne by some writers, but by others as the step on which stood the balustrade separating the nave from the sanctuary; in both cases its place was between the bema and the ambo. In the cathedral at Cefalù at the nave entrance of the choir, on each side, are white marble thrones ornamented with mosaics: over the one on the right is written "*sedes episcopalis*"; over the one on the left "*sedes regia*"; GALLY KNIGHT, *Normans in Sicily*, 8vo., London, 1838, p. 220; similar seats at Monreale are noticed p. 289. The ambo appears to have extended in process of time into the nave, and to have been enlarged into the *CHOIR* or *chorus*, *u*, which then contained two ambones; that having the paschal candelabrum, and being on the right hand side looking from the altar, was called the Gospel ambo, *x*; while the Epistle ambo, *y*, was placed opposite to it. The choir, *chorus*, *suggestum*, was separated from the rest of the church by a screen wall, and contained seats for the inferior functionaries, who received directions from the bema through grated openings, *cancelli* (whence the English term chancel), in the screen, *balustrum*, *balustrum*, *clathra*, *septum clathratum*, *columnellarum septum*, of the sanctuary.

The *abaton*, *aduton*, *anactoron*, *apsauston*, *hagiasma*, *hagion*, *hilasterion*, *sacrarium* or sanctuary, *s s*, contained the *exedra* or apse, *u*, and the altar, *x*. When the apse, hemicycle, or *absis*, generally surmounted by a half-dome, *concha*, or *conchula bematicis*, was raised off from the nave at its chord, and thus formed the whole of the sanctuary, the Lord's table was placed just within the cancelli, as in the church of S. Sabas at Rome; but the sanctuary sometimes extended into the nave for the length of one bay between the columns, as that of S. Giorgio in Velabro, or more, as at that of S. Clemente, and even three bays, as that of Sta. Maria in Cosmedin, in which cases the altar or *sacrificatorium* was placed as much further from the chord as was deemed desirable, and raised one or more steps above the floor of the sanctuary. The pedestal or foundation of the altar-table formed a small *CRYPT*, called the *martyrium* or confession, in which relics are supposed to be preserved. In the early churches the *altare* or *mensa sacra* was not placed close to the wall at the end of the building, but at some little distance from it; so that the bishop's throne, *τ*, might be behind it, and room enough left in a void space to encompass or surround the altar, and this space is called the *DIACONICUM* by some authors. The altar was of wood at least until probably the epoch of Gregorius Nyssenus (ob. 396) and the council of Epone (509), which decreed that no altars except those made of stone should be consecrated. In some of the more stately early churches the altar was overshadowed by a sort of tabernacle, *pyrgos*, or more commonly *ciborium* or *CRORIUM*, the last being a name frequently but improperly given to the pyxis; the ciborium was called in later times a baldachin; in the Milanese churches there may still be seen the ciborium carrying a crown, from which a *peripetasma*, *aulæum*, or *velum* depends, while a canopy, *umbraculum*, or real BALDAQUIN, is suspended over all. As a general rule, the officiating priest and the presiding presbyter in the early churches were so placed as to face at once the east, the choir, and the congregation. The *APSE*, *presbyterium*, *consessus*, *u*, contained the *thronos*, *cathedra*, *sedes*, or bench of the bishop, *τ*, raised above the *sedilia*, *subsellia*, or seats of the presbyters, which were ranged along the curved wall, as still seen in the church of Sta. Maria at Torcello, on each side of the bishop, whose *BEMA* or place of speaking gave its name not only to the apse, but in some cases to the whole sacrarium: the apse is still called *tribuna* by the Italians, who thus preserve the tradition of the original use of basilicas as places of judgment. The oldest Latin apses rarely have windows, which are seen in the buildings of the eastern church. The addition of semicircular or angular apses at the ends of the aisles is also supposed to have been of eastern origin: for PAULINUS, *Ep. xii* ad Severum, observes that there was a

secretarium, otherwise called *pastophorium* or *AUMBREY*, on the right hand looking from the altar, and another on the left; the first, *w*, was called the *paratrapezon* or side table, *oblationarium*, *paratorium*, and *prothesis*, or *CREDENCE* table, where the offerings of the congregation were received, and whence the bread and wine were taken that were consecrated at the altar; the second, *y*, was the *diaconicum bematicis*, *evangelium*, *thesaurus*, *scenophylacium*, *ceimeliarchium*, *gazophylacium*, where the sacred vessels were deposited while in use, as well as a vestry, and also a chapel for the officiating priests. When these latter purposes were fulfilled by treasuries, sacristies, vestries, muniment rooms, and similar apartments devoted to the peculiar purpose, these recesses became chapels: the ancient usage is still observed in the church of S. Dimitri at Smyrna, where apses appropriated to the uses above-mentioned are only veiled by curtains. The upper part of the balustrum seems to have been veiled by one or more curtains, *amphithura*, as well as the ciborium, the separations between the nave and the aisles, the *hyperoa* or women's galleries, and the anteporico: the rings remain in this last place at the church of S. Giorgio in Velabro at Rome.

It has been stated that the basilica at TRÈVES, mentioned in the preceding article, is the only profane edifice of the sort out of Rome which has been made a Christian church, it having been repaired (1840-7) for the use of a Lutheran congregation; and that the same city is the only one out of Italy in which there exists a Christian basilican church of the Roman times: it was built by the bishop Agritius in 328, and dedicated to S. Peter; SCHAYES, *Hist.*, i. 71, gives slight illustrations of both from the work by SCHMIDT, *Baudenkmale*, Trier, 1836, which should be examined with reference to the second apse, added in the twelfth century. VIOLETT-LE-DUC, *Dict. s. v. Architecture*, i. 169, gives a plan and section of the church at Vignory, in the department of the Haute-Marne in France; this building, which exhibits a close relationship to the Roman basilican churches, is placed by him in the tenth century. The church called the basilica of S. Boniface, commenced at Munich in 1836 (BUILDER, *Journal*, vi, 547, and viii, 595), appears to have been intended as an imitation of S. Paolo fuori le Mura at Rome, which was being rebuilt in 1851.

Approximate Dimensions of Churches at Rome generally mentioned as examples of a Basilican Plan; although the thirteen marked * are those to which the term *Basilica* is most generally restricted.

NAMES OF CHURCHES	Length of Interior exclusive of the Apsis			Width of Interior including the Aisles			Width of the Nave only		
	Feet	Meters	Feet	Feet	Meters	Feet	Feet	Meters	Feet
Sta. Agnese fuori le Mura	70.55	21.50	53.56	31.03	9.46	31.03	31.03	9.46	31.03
S. Agostino	159.65	48.72	76.22	33.47	10.21	33.47	33.47	10.21	33.47
Sta. Balbina	79.83	24.34	None	47.99	14.62	47.99	47.99	14.62	47.99
S. Bartolomeo in Isola	96.82	29.48	80.77	29.87	9.11	29.87	29.87	9.11	29.87
S. Crisogono	154.50	47.06	76.22	37.08	11.30	37.08	37.08	11.30	37.08
S. Clemente	118.45	36.05	70.55	36.05	10.99	36.05	36.05	10.99	36.05
SS. Quattro Coronati	79.31	24.20	47.38	24.20	7.39	24.20	24.20	7.39	24.20
SS. Cosmo e Damiano	119.99	36.57	72.10	32.96	10.03	32.96	32.96	10.03	32.96
Sta. Croce in Gerusalemme*	119.99	36.57	72.10	32.96	10.03	32.96	32.96	10.03	32.96
SS. Dodici (XII) Apostoli*	119.99	36.57	72.10	32.96	10.03	32.96	32.96	10.03	32.96
S. Giorgio in Velabro	99.91	30.45	59.74	29.87	9.11	29.87	29.87	9.11	29.87
S. Giovanni Laterano (five aisles)* ..	296.64	90.39	177.16	61.80	18.84	61.80	61.80	18.84	61.80
S. Giovanni presso Porta Latina ..	69.61	21.11	45.32	24.72	7.53	24.72	24.72	7.53	24.72
S. Lorenzo fuori le Mura*	200.85	61.22	70.04	37.08	11.30	37.08	37.08	11.30	37.08
S. Lorenzo in Damaso*	200.85	61.22	70.04	37.08	11.30	37.08	37.08	11.30	37.08
Sta. Maria in Araceli	203.42	62.04	90.64	48.41	14.76	48.41	48.41	14.76	48.41
in Cosmedin*	98.36	29.99	58.19	23.69	7.22	23.69	23.69	7.22	23.69
in Domnica or della Navicella	101.97	31.03	65.40	39.14	11.93	39.14	39.14	11.93	39.14
in Monte Santo*	255.44	77.85	104.03	54.07	16.48	54.07	54.07	16.48	54.07
Maggiore*	255.44	77.85	100.94	44.80	13.66	44.80	44.80	13.66	44.80
sopra Minerva	160.08	48.78	87.03	41.71	12.71	41.71	41.71	12.71	41.71
S. Martino in Monte	203.94	62.10	83.43	48.41	14.76	48.41	48.41	14.76	48.41
S. Nicola in Carcere	110.90	33.80	60.77	24.30	7.41	24.30	24.30	7.41	24.30
SS. Nereo ed Achilleo	83.43	25.42	58.19	26.26	8.00	26.26	26.26	8.00	26.26
S. Paolo fuori le Mura*	371.92	113.37	214.03	79.82	24.34	79.82	79.82	24.34	79.82
S. Pietro in Vaticano* (as originally)	354.63	108.10	208.76	77.64	23.63	77.64	77.64	23.63	77.64
in Vinculi*	168.92	51.50	92.70	51.50	15.68	51.50	51.50	15.68	51.50
Sta. Prassede	139.56	42.50	83.94	44.29	13.49	44.29	44.29	13.49	44.29
Sta. Sabina	158.62	48.39	82.40	44.80	13.66	44.80	44.80	13.66	44.80
S. Sebastiano fuori le Mura*	172.01	52.43	67.90	30.35	9.25	30.35	30.35	9.25	30.35
S. Vincenzo alle Tre Fontane	172.01	52.43	67.90	30.35	9.25	30.35	30.35	9.25	30.35

It must not be forgotten that there are many exceptions to the above remarks: some basilican churches have no visible architectural division of the nave from the aisles; it is not quite clear whether the great doors were in the wall of the exonarthex, or of the church itself, or of the esonarthex; the doors were not round, but square at the head, according to S. CARLO BORROMEO, who also, in his *Instructions*, directs the location of the lions at the threshold; there were probably three doors of entrance until a late period; some authors reckon three ambones, one for the recitation of the Old Testament, another on the right hand looking from the altar for the Gospel, and the last on the left hand for the Epistles; other writers are content with only one ambo, divided into two stages; the *amphithura* is often supposed to have been drawn from the middle, and is said by S. Chrysostom "to be drawn up"; the font was not placed within the vestibule, and on the left hand, until the seventh century; the aisles are not always found to be of equal width; thus at the church of S. Clemente at Rome, the southern or left hand aisle on entering is larger than the northern one: this has been explained by supposing that when the early basilicas had no galleries, the same system of separating the sexes caused the left and right sides to be respectively occupied by the males and females, which in later times, when ORIENTATION had prevailed, reversed the arrangement in conformity with a symbolism requiring the males to be on the south side, and not allowing the erection of one of the aisles in the churches of those monastic orders whose rules forbade the presence of females within their walls. Where there were galleries or triforia, as in the churches of Sta. Agnese, and of S. Lorenzo in Agro Verano, the southern side was appropriated to the widows, and the northern side to the unmarried females. In many German churches with the altar at the east end, the men sit to the right or south; in the Greek church the females occupy the front end of the church, and, being separated by a wall from the men, the males are obliged to enter by side doors.

In again referring to the work of ZESTERMANN, *De Basilicis*, 4to., Brussels, 1847, it is desirable to notice that the portion of the third book in which he contested the analogy between the pagan and Christian basilicas, was successfully refuted during the following year in the *KUNSTBLATT* and other German scientific periodicals. The question of ORIENTATION has hardly been considered in the course of the preceding paragraphs; but as they are best illustrated by the church of S. Clemente, which, like those of S. Pietro and S. Giovanni in Laterano, has the altar at the west end, the above remarks as to the cardinal points must be read with reference to the situation of those examples. The church of S. Clemente has been carefully illustrated by MYLNE, *Quarterly Papers on Architecture*, 4to., 1845.

CAHIER, in *Annales de Philosophie Chrétienne*, 8vo., Paris, 1830, etc., xvii, 419; GERBERTUS, *Vetus Liturgia Alemannica*, 8vo., 1773, p. 181; COTELERIUS, *SS. Patrum opera*, fol., Amst., 1724, i, 190; S. CARLO BORROMEO, *Instructionum Fabricæ libæ*; in *Ecclesiæ Mediolanensis*, fol., Milan, 1582, p. 177; GOAR, *Rituale Græcorum*, fol., Paris, 1647.

Besides the above works, reference may be made to the last part of BUNSEN, *Die Basiliken*, Munich, 1842, in illustration of that by GUTENSOHN and KNAPP, *Denkmale der Chr. Relig.*, etc., fol., Munich, 1823; to GAILHABAUD, *Monumens*, ii, for the Roman churches of S. Sabas with a vestibulum or anteporico of two Ionic columns, with the pillovers of the capitals turned to the road; of Sta. Maria in Cosmedin; of S. Clemente; and of S. Giorgio in Velabro, built in the seventh century by Leo II with the materials of the basilica Semproniana; and to the works of ARNALDI, *Delle Bas. Antiche*, 4to., Vicenza, 1769; SARNELLI, *Ant. Basilicogr.*, 4to., Nap., 1686, and those mentioned under the articles AMBO and APSE.

MORONI, s. v., observes that some writers suppose that the word basilica was used in the fourth and fifth centuries for a

church dedicated to a saint, in opposition to *ecclesia*, used to denote a cathedral: DUCANGE, s. v., mentions the supposed use of the term basilica for a monastic church, in opposition to *ecclesia* as a cathedral or parish church; and points to various other applications of the word; as to a church before its consecration; to a shrine, canopy, or tomb (apparently of wood in most cases) over the graves of distinguished personages, *tumba* and *porticulus* expressing the monuments erected to persons of inferior rank; to an altar; and perhaps to a nave; S. JEROME writing to Heliodorus, *Ep. 3*, uses the term basilicæ for chapels or shrines according to some commentators, but others consider that he implied the great portals.

BASIMOF or BASMOF (VASILY), see BAZHENOF.

BASIN or BASON. An ornamental reservoir, generally formed in an excavation in a soil either already retentive of water, or rendered so by PUDDLING a bed of clay around the basin during its formation. Sometimes a basin is lined with gravel or bricks, tiles, stones, cement, or asphalt; but where dryness around the margin of a basin raised above the level of the ground is an object, a metal casing is preferable; but is now rarely employed from its expense and temptation to theft. When leaded basins were used, they were made with brick or stone walls, about a foot in thickness, and a bottom of about half that substance. The materials were set in plaster, as lime would injure and eat the lead. When the plan of a basin is not simple, as a square or circle, but is still geometrical, it is called a figured basin; when the plan is not geometrical, it is called by names appropriate to itself, as a shell basin, etc. A basin and trench (Fr. *bassin à rigole*) is a basin with a channel on the outside of its CURB, generally below, but sometimes above, the surface of the reservoir, and filled by thin jets or threads of water. 2. 58.

BASKET. The term applied to the BELL of the capital of the Corinthian order, when it is ornamented, as in some modern instances, with an imitation of wicker work, in allusion to the legend related by VITRUVIUS, iv, 1: and to a sort of vase, equally an imitation of wicker work, sometimes filled with fruit and flowers, executed in real or artificial stone, or in metal, and used as the termination of various species of decoration. BACK BASKET. 2. 6.

BASLE, BAILE OF BASEL (BASILIA). The capital of the half canton called Basle-ville in Switzerland. The city which rose into importance upon the destruction, in A.D. 450, of Augusta Rauracorum, situated at about seven miles distance from it, and known as Augst-Basle or Basle-Augst, was the seat of a bishopric, suppressed in 1798. The greater part of the town is placed on the left bank of the river Rhine, and communicates with the other portion by a picturesque wooden bridge, 600 feet long, built in 1225, having stone piers. The city is surrounded by walls with gateways in a good state of preservation; the Paulus-thor, commonly called the Spalen-thor, dating from 1400, retains its double portcullis, with two flanking towers and a barbican. There are a few curious old buildings, such as the Spiezhof and the Geltenzunft, and some fine painted glass of the fifteenth and sixteenth centuries in the Schützenhaus; several of the numerous fountains are ornamental, and that in the market place is thought one of the finest small works of an architectural character in Switzerland. The cathedral, dedicated to the Virgin, and now used for the Protestant service, was commenced in 1019; but the northern tower, 250 feet high, was not finished till 1500. GAILHABAUD, *Monumens*, iii, observing that the pointed arch of the twelfth century is seen throughout the building, concludes that this edifice is a proof of the introduction of such construction into Germany and Switzerland long before its appearance in France. The church has two aisles on each side, one of which is continued round as a tribune. At the extremity of the northern transept is the Porte de S. Gall, with semicircular arches, and over it is a ROSE WINDOW called the *roue de fortune*. The altar is situated between the choir and the nave, nearly under





the richly carved roodloft, dated 1381, which with the font, dated 1465, are specially shown to strangers. The building is constructed of a rapidly decomposing red sandstone, and appears more decayed than is the fact. The extensive and picturesque cloisters, dating from the fourteenth century, are formed by successive quadrangles and large halls, forming a sort of *camposanto* for distinguished Protestants: these are on the south side of the choir.

The abbey of S. Leonard, with several monasteries and churches, are now in the possession of the Protestants; thus the *Waisen-haus* or orphan asylum and house of correction was a Cistercian convent; it retains its original character, and presents a good specimen of such religious establishments, with their guest room (*hospitium*), *capitularium*, and cemetery. The town possesses besides six large educational establishments, the public library, museum, and Holbein gallery, which are placed in an edifice built before the year 1436. The *Rath-haus*, post-office, theatre, and casino, deserve to be called public buildings. 14. 28.

BAS-RELIEF. The French term adopted in England for **BASSO RILIEVO**.

BASS or LIMEWOOD. The name given to the *Tilia Americana*, a wood of Canada.

BASSÆ. The ancient name of a village in the south-western angle of the state of Arcadia in Greece. It is situated on Mount Cotylus, about five or six miles from Paulizza, a village representing the ancient Phigalia, whence the sculptured friezes hereafter mentioned, and now in the British Museum, are called the Phigalian marbles. They were discovered by Messrs. C. R. Cockerell of London and J. Foster of Liverpool, in conjunction with Baron Haller, in 1812 (and not in 1818, as stated by BLOUET), among the remains of a temple dedicated to Apollo Epicurius (the Deliverer) at Bassæ. PAUSANIAS, *Desc. Gr.*, viii, 41, mentions it as an edifice "which, together with its roof, is of stone; it surpasses all the temples which are in Peloponnesus, with the exception of that at Tegea, in the beauty of the stone and harmony of the proportions. Ictinus, the architect of the temple at Phigalia, flourished in the age of Pericles, and constructed for the Athenians the temple called the Parthenon." He died 429 B.C. This building may be classed amongst the most important architectural antiquities of Greece, from the ascertained era of its design, the character of its style of art, the beauty of the ornaments, and the extent of its preservation.

The temple was hexastyle peripteral, with fifteen Doric columns on the side, about 48 feet 3½ inches wide in front on the top step, and 125 feet 7½ inches long. The walls and columns were constructed of the hard and beautiful limestone of the country, and metal cramps appear to have been used in profusion; but the roof, ceilings, sculpture, and Ionic capitals, were of marble. Its position differs from that of the generality of temples, as it faces the north; but a large doorway 6 feet 4 inches wide (totally omitted by BLOUET), and opening into the sekos of the temple, conforms to the Greek practice of ORIENTATION. Other remarkable variations from the usual type of a Grecian temple are exhibited in this example. The porticos of the pronaos and opisthodomos are remarkable for their great width; the outer entablatures of their inner columns were enriched as at Olympia with sculptured metopes, the fragments of which may be seen in the British Museum. The trabeated marble ceilings were remarkable for their structure and beauty. The two columns of the pronaos and opisthodomos, centred with the third columns on the side, stand between antæ and on a step 4½ inches high, which runs as a plinth round the body of the building: both the pronaos and opisthodomos have their floor level with the pavement of the peristyle. The cella, having a floor 12½ inches above this step, contained on each side five columns 2 feet 2½ inches in diameter, of an Ionic order, engaged for half their diameter in piers, the shafts projecting altogether 3 feet 9¾ inches from the walls. There seems to be no doubt that a

column of a Corinthian or Composite order stood in the middle of the width of the cella. The flooring of the cella has a panel in it. The pavement of the porticos is perfect in all parts except the sekos, which may have received a mosaic or other precious ornamentation. The masonry is remarkable for its harmony and execution. The steps of the podium and the first course round the cella, have double sinkings in diminution of their bed, which are worthy of attention as respects relief and effect. Three of the external columns and all the main body of the edifice have been removed. These columns were 3 feet 9½ inches in diameter, and 19 feet 5½ inches in height, the shafts being composed of six stones with twenty flutes: only a great part of the architrave remains *in situ*. The unequal widths of the intercolumns, and consequently of the metopes, deserve attention. The head of the channel of the triglyph is cut upwards to gain depth of shade. BLOUET shows a stool at the top of each abacus, and each of the guttæ of the mutules has a piece of stone let into a hole sunk in the surface of the mutule, as at Selinus and Pæstum. The crowning molding of the pediments was a *cima recta* of great peculiarity and beauty, as may be seen at the British Museum: the honeysuckle and lotus with which it is enriched are not exactly perpendicular either with the horizon or with the rake of the pediment, but between the two. The *harmos* was part of each covering tile, being cut with the tile out of the solid block.

The attached Ionic order of the cella is unique as regards its base, flutes, and angular capital; the eye of the volute is a distinct piece of marble let into a mortice and dovelled. The frieze was enriched by a basso rilievo 2 feet 1 inch high and 99 feet long, attached to the wall by metal ties; one portion represented the war of the Greeks and Amazons, and the other the contest between the Centaurs and Lapithæ. The Corinthian capital, which scarcely gave sufficient indications for restoration when sketched by Mr. Allason, has disappeared.

Mr. Cockerell has executed this peculiar Ionic capital in scagliola at Mr. Baring's house, the Grange, Hampshire; and at the Hon. Robert Clive's, Oakley Park, Ludlow, Shropshire; as well as at the University Galleries and Taylor Institute at Oxford, in 1845, with some modifications. *BUILDER Journal*, iv, 521.

The principal writers upon this temple are CHANDLER, *Travels in Asia Minor*, 4to., Oxford, 1825, quoting BOCHER about 1770; POUQUEVILLE, *Voyage en Morée* en 1798; DODWELL, *Topog. Tour through Greece*, 4to., London, 1819; GELL, *Itin. of Greece*, 4to., Lond., 1810; LEAKE, *Travels*, 8vo., Lond., 1830; HUGHES, *Travels*, 8vo., London, 1830; STACKELBERG, *Der Apollo Tempel zu Bassæ*, fol., Frankfurt, 1826; DONALDSON, in *Inedited Antiquities of Athens*, vol. iv of STUART, fol., Lond., 1830; and BLOUET, *Expédition de Morée*, fol., Paris, 1835.

In drawing up this article advantage has been taken of permission kindly granted by Professor Cockerell, R.A., to compare it with the drawings prepared by him for publication, which exhibit essential variations from those in the works of Donaldson, Blouet, and Stackelberg.

BASSANO (ALESSANDRO) is mentioned by MILIZIA as an architect of reputation, quoting DE LA LANDE, *Voyage en Italie*, 12mo., Paris, 1769, viii, 283; but that work gives the Christian name as ANNIBALE, and TICCIZI gives an article to each. According to CICOGNARA, *Storia*, etc., fol., Prato, 1823, ii, 318, Annibale Bassano designed in 1493, and superintended the erection of, the Loggia del Consiglio at Padua, and his own house near the bridge of S. Angelo dei Specchi; the first named building, which perhaps was finished under his nephew Alessandro, was completed in carcase, in 1526, and has been erroneously attributed to Jacopo Tatti (Sansovino). TCHISKA, however, gives the reputation of this work to "Alessandro the younger." 62.

BASSET, see **OUTCROP**.

BASSI (MARTINO), born about the year 1542 at Seregno in the Milanese territory, is first mentioned in the list of "ingegneri" practising at Milan under the date 1567. He was then

entrusted with the direction of the works which had been commenced in 1560 for the new church of S. Vittore designed by Alessi, and about five years later held the same appointment with regard to that portion of the façade of the church of Sta. Maria presso S. Celso executed from the designs of the same architect: for this church Bassi designed the altar of the Virgin under the cupola. Having objections to the crypt, font, and other works at the cathedral, which were being designed by Pellegrini, he published *Dispareri in Materia d'Architettura et Perspettiva*, etc., 4to., Bressa, 1572, which is curious as containing plans and sections of that date, and the opinions in his favour given in writing by Palladio, Barozzi, Vasari, and Bertani. In 1572 also he was appointed one of the engineers to the government; and in 1586 was engaged temporarily at the cathedral, but received the permanent appointment of architect to that edifice 23 November 1587, Pellegrini having gone to Spain. Amongst the many public and private works entrusted to Bassi, were portions of the churches of Sta. Maria della Passione de' Canonici Regolari Lateranesi, and of S. Stefano Maggiore, and of the churches of the B. V. di Rô, and of S. Fidele de' PP. della Compagnia di Gesù, both designed by Pellegrini, if not already partly executed, as the care of Bassi was chiefly directed to their choirs and tribunes. It is not clear whether the Casa Professa, or college adjoining the church of S. Fidele, was designed or only superintended by Bassi, whose restorations and other extensive works at the church of Sta. Agnese give him a claim to the design of the existing building. At Pavia he was consulted upon the Certosa and the Collegio Ghislerio: at Lodi he designed the remaining old portion of the *Vescovado*, and the monastery of S. Vincenzo now partly destroyed. The designs made by Pellegrini for the church of S. Gaudenzio at Novara were submitted before adoption to Bassi, who seems to have been always on the most friendly terms with his rival, and to have suffered precisely the same annoyance from Magenta and Tolomeo with regard to the great work of his own life as he had caused to Pellegrini. Bassi succeeded Giovanni Cucco, some authors say Pellegrini, about 1574, as designer of the new basilica of S. Lorenzo Maggiore at Milan, and carried on the works until 1587, when his critics hindered the construction of the dome and prevented the resumption of the works until 22 March 1590. Acting upon the opinions of Alziati and Seregno and his own self-reliance, the chapter then passed a vote of entire confidence in their architect; but Bassi, who had cleverly negotiated with his critics until his victory was assured, died in 1591, before the cupola had advanced to completion, and it was afterwards slightly varied from his design. FERRARI, *Dispareri*, etc., di M. Bassi, 4to., Milan, 1771, gives the plan of the church and the papers written on both sides, as well as a full biographical account of this eminent architect.

BASSIA LONGIFOLIA. A tree of the woods of Cuddapah, East Indies, from which the natives derive a timber called *yessa*, *mohi ka jar*, and *yelloopai*, or *illupie*, which is as hard and durable as teak. 14. 71.

BASSO-RELIEVO. A term applied to sculpture having that amount of projection from the background which is given to a figure or to ornament, when the work stands out a trifle less than one quarter of what it would if the entire object were applied to that ground; so that in general the subject appears almost absorbed in the ground. RELIEVO.

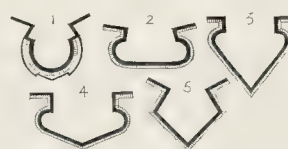
BASTARD ASHLAR. The term properly applied to stones of various dimensions, which, in order to lessen the expense of carriage, are merely scapled or broched nearly to the required form and size at the quarry. ASHLAR.

BASTARD STUCCO. The name given to one of the many modes of executing plasterers' work. After putting on the pricking up coat, the workman adds the floated coat, in which the hand-float is not used, waits until this second coat is as dry as possible, and then applies another coat made of three parts of fine stuff (pure lime saturated with water), with one part of sand, and a small quantity of hair.

BASTARD TUCK POINTING. The term used to describe a sort of POINTING to brickwork now becoming usual: common tuck pointing has three colours, the brick, the stopping, and the white line; bastard tuck pointing has only two distinct colours, the brick and the white line, as the mortar joint is lost in the colouring of the brickwork, the stopping not being applied.

BASTIDE. The Provençal term used to express any of the little white detached country houses which are seen in thousands round Marseilles and its neighbouring towns. The word is derived from the late Latin term *bastida*, to which no precise meaning has been given. 5.

BASTION. The name applied to the projecting mass which in some of the old styles of laying out the terraces round a house, is placed at the principal if not every external angle, as seen in Kensington Garden east wall. When synchronism is to be maintained it must be recollected that the round bastion, fig. 1, seems to have prevailed until 1500 in France and Italy, that the form given in fig. 2 appears to have supplanted it, and to have been superseded in Italy about the year 1530 by figs. 3 and 4, which do not seem to have been adopted in France much before 1630, while ten years later (1640) the present form, fig. 5, was finally adopted in Europe. Of this last figure it may be remarked that the open side is next the mansion, and is the gorge, that the two inner faces are the flanks, and that the remaining sides, opposite to the open country, are the faces:

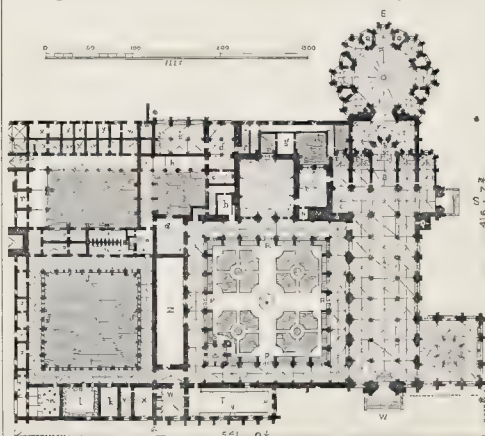


if the work is walled, the construction connecting two bastions is called the *curtain*, in conformity with the terms used by military engineers.

BASYL (SIMON), see BASIL.

BAT. The name given by workmen to a portion of a brick less than one-half of the length of the brick from which it has been broken; it may be required to fill up a space in a defined length, and is then called a *CLOSER*. Half bats and quarter bats are also commonly mentioned by bricklayers. 1.

BATALHA (DOMINICAN PRIORY OF). One of the grandest of the monasteries which have remained to the present time. The establishment was founded in 1388 by king John I. of Portugal, in his province of Estramadura, and the buildings (erected with a calcareous species of limestone abounding in the neighbourhood), which occupy the site of the celebrated battle of Algubarrota, belong to the hundred and twenty-five years



immediately subsequent to that period. The west front of the monastery extends about 460 feet, exclusive of the mausoleum of the founder, which is 67 feet square; the depth is about 300

feet, exclusive of the *capilla de los Reyes*, which is 125 feet in external diameter, with a central vault 65 feet in diameter. The majestic stone-roofed church, with some windows entirely filled by tracery, others possessing some very fine and dated stained glass; the mausoleum above mentioned; the grand quadrangular "royal" cloister, 182 feet square, with three other cloisters, one of them being 142 feet square; the chapter house, 63 feet square; and the refectory, 98 feet long by 31 feet wide, constitute the leading features of one of the principal groups of such buildings in Europe. This has been described, with illustrations which require some little revision, by MURPHY, *Plans, etc., of the Church of Batalha*, fol., London, 1795. Its recent condition is noted in the *BUILDER Journal*, 1847, p. 402, which at p. 425 contains remarks on the architect employed: the masters of the works appear to have been DOMINGUEZ, OUGUET, VASQUEZ, EVORA, FERNANDEZ, GOMEZ, and MENDEZ; RACZYNSKI, *Letters, etc.*, 8vo., Paris, 1846; but HACKETT or AQUETE, an Irishman, and STEPHENSON, are mentioned by MURPHY as the architects, the first at the end of the introduction to the work above quoted, the second in *Travels, etc.*, 4to., London, 1795, p. 44.

BATARDEAU, see COFFER-DAM.

BATAVIA. The capital of the island of Java. The city, founded in 1616, upon the banks of the river Tjiliwong and of numerous canals, consists of three portions; the old town, about a mile in length, called Jaccatra by the natives, containing the principal offices and warehouses of the Europeans; the Chinese quarter; and the street of villages forming the suburban or new town, stretching for about four miles inland to the south. The houses are chiefly built of brick covered with stucco, and the floors are paved with marble slabs, which are kept constantly damp for the sake of coolness: the best houses in the old town were demolished between the years 1796 and 1816, when the Europeans, especially the English, introduced the adoption of detached villas with large gardens. The principal buildings are the governor's palace, containing most of the public offices, not finished until 1827; the *stadhuis* or town hall, "an elegant and noble structure of its period"; the house of the Netherlands East India Company; the Lutheran church, "good enough for an European city"; the Willemskerk (Reformed church), "an old and not very solid building, with a simple and beautiful interior"; the Roman Catholic church, "small and mean"; a Mahometan mosque; some Chinese pagodas or temples; several schools; three hospitals; the exchange, a plain and simple modern edifice with an open colonnade; the bank of Java; the custom house; the well maintained naval stores, which are two stories in height; the magnificent *lombongs* or coffee magazines; the society of arts and sciences; the theatre; and the *Harmonie*, which is a club house and assembly rooms. DUMONT D'URVILLE, *Voyage Pittoresque*, 4to., Paris, 1834, p. 243.

BATEMENT. A term used by old authors for ABATEMENT.

BATEMENT LIGHT. A window or portion of a window in which the sides of the aperture which is left to admit light are upright, while the bottom is not horizontal: the term implies a light with a BATEMENT, the batement being the portion marked a within the dotted lines.



16.

BATH (the CAER BADON of the ancient Britons, the Roman *AQUÆ SOLIS*, *FONTIS CALIDÆ* of Antoninus, *THERMÆ SUDATÆ*, and *BALNEA BADONESSA*). A city situated on the river Avon, in the county of Somerset in England, and united with the bishopric of Wells. Standing in a picturesque valley, and surrounded by an amphitheatre of hills of considerable elevation, few cities possess so many advantages as regards beauty of situation: nor have these advantages been neglected in the erection of its elegant buildings, which are nearly all in the Roman architecture of their period. The streets are very regular, clean, and well lighted. The ancient buildings of the city are now but few; in 1755, on pulling down the priory for the

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purpose of erecting the Kingston baths on its site, some Roman baths and sudatories of large dimensions were discovered at about 20 feet below the surface of the ground. Other remains of temples, etc., were dug up when erecting the great pump room in 1790; these, with other antiquities which have from time to time been discovered, are preserved in the Royal Literary and Scientific Institution. They are well illustrated in Lysons. The older mansions, with the exception of Helling House, built in the reign of Queen Elizabeth, do not date earlier than the commencement of the eighteenth century. The celebrated palace of Beau Nash, erected by Thomas Greenway, still exists, though partly used as a tavern, and partly connected with the theatre. Wood describes it as being "so profuse in ornament that none but a mason to show his art would have gone to the expense of those enrichments".

To the taste, energy, and skill of John Wood, and of his son, both architects "of Bath", the city is in a great measure indebted for its present magnificence; he was greatly assisted by Ralph Allen, Esq., who opened the extensive quarries of free stone on his estate contiguous. Queen's Square, the first stone of which was laid 27 January 1729, was the first great work; the façade of the north side of the square is decorated with Corinthian columns and pilasters; within the area is a garden with an obelisk in the centre 70 feet high; the North and South Parades, the former of which is about 580 feet long and 52 feet wide, the latter 400 feet long, are raised upon arches 18 feet above the original level of the ground; adjoining to these is the magnificent town residence of Ralph Allen; all these were erected by the elder Wood. The Circus, the houses of which are decorated with coupled columns of the Doric, Ionic, and Corinthian orders superimposed, the lower frieze being enriched with medallions and other ornamentation in extraordinary variety, was also designed by him, but erected by his son of the same name, who also designed the not inferior Royal Crescent and Assembly Rooms. The first stone of the former was laid 13 May 1767; it is built in a semi-elliptical form, having one order of Ionic columns which support the upper cornice. The commanding situation of this pile of building renders it a grand and striking object from the surrounding hills and valley. To the north of the Royal Crescent, at a greater elevation, are several piles of buildings little inferior to those above mentioned: such are Catherine Place, S. James's Square, Cavendish Place and Crescent, Sion Place (the three last designed by John Pinch), Lansdowne Crescent, Portland Place, Camden Place, etc. In the lower town, Laura Place, commenced in 1788, is a handsome square arranged lozengewise, forming an elegant approach to the vista of Great Pulteney Street; these with the north wing of Sydney Place, are the work of Thomas Baldwin. New Sydney Place is also designed by John Pinch, and presents a good specimen of the superior qualities of the local stone, or Bath oolite.

The conventual church of the Benedictines, dedicated to SS. Peter and Paul, now commonly called the abbey church, was commenced by bishop Oliver King (1495-1503), about the year 1499, but remained many years without its roof, besides being dismantled in the reign of king Henry VIII. About 1572 Peter Chapman commenced repairing it; the work was continued by bishop Montague and others, and completed in 1616. In 1835 the interior of the church was entirely remodelled, a new organ erected, a new stone screen (designed by Edward Blore) put up, the choir altered and repaired, and the exterior extensively repaired; all the alterations being effected by the corporation of Bath, and under the direction of G. P. Manners. It is considered to be the last building of the Perpendicular period of Gothic architecture erected in England of great magnitude and purity, but it is not so largely decorated as other works of the same date. This church was formerly called the "Lantern of England", on account of the number (fifty-two) and large size of the win-

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dows. It consists of a nave 30 feet 3 inches wide by 78 feet in height to the ridge-rib of the arching; with the aisles its total width is 74 feet; the length of 218 feet comprises the nave and choir, which latter is 75 feet long and 78 feet in height, and is richly groined. The interior of the choir is spoiled by unsightly galleries, and great *modern* pews. The tower, which rises from the intersection of the cross, is externally about 40 feet by 30 feet, and 168 feet high.

The Florid Perpendicular Gothic monumental chapel of prior Birde, attached to the south side of the choir, and erected in 1535, was restored in 1833 by Edward Davis, who published a series of illustrations of it entitled *Gothic Ornaments, etc., of Prior Birde's Oratory*, fol., London, 1831.

Amongst the numerous churches and other places of worship, the hospitals and other public buildings, so few will be found worth specially noticing here, that reference for the older edifices is made to the names of their architects, John Wood, sen. and jun.; John Palmer; — Lightholder; Thomas Baldwin; Thomas Attwood; William Killegrew, etc. The later erections consist of S. Mary's church, Bathwick (Perpendicular Gothic), built 1814-20, and S. Saviour's church, Larkhall (Perpendicular Gothic), erected 1829-32, with a tower 120 feet high, both are by John Pinch. Holy Trinity (Free) church, James Street, (Florid Gothic), was erected by James Lowder in 1821-2, at a cost, including the ground, of £12,000; it accommodates 1,300 persons. S. Mark's, Lyncombe (Perpendicular Gothic), erected 1830-32, for £5,100, by G. P. Manners. S. Michael's church (Early English Gothic), was entirely rebuilt for £8,500, in 1835-6, by G. P. Manners; the spire is 182 feet high. S. Stephen's church, Lansdown (Decorated Gothic), erected 1846, for £6,000, by James Wilson, F.S.A., with tower 120 feet high. S. Matthew's (new) church, Widcombe (Decorated Gothic), erected 1846-7, for £5,300, by Messrs. Manners and Gill; the tower, 150 feet high, is at the south-west angle.

New King Street Wesleyan chapel (Decorated Gothic), opened 10 Dec. 1847, erected for £3,000 by James Wilson, F.S.A. The Catholic and Apostolic church in Guinea Lane (Norman), by G. P. Manners, erected in 1841. The Independent chapel, Argyle Street, erected in 1789, was enlarged in 1814, and again in 1821, when a new Roman Ionic façade was added by H. E. Goodridge; who with his son has erected in 1854 a new Independent chapel in Charlotte Street, in the Byzantine style. The plan is of a horseshoe form with lantern light in centre, supported by marble columns inside. The Moravian chapel, Charlotte Street (Roman), 1845, by James Wilson, has a bold Corinthian portico. The New Jerusalem church in Henry Street (Roman Ionic) was erected in 1844 by H. Underwood.

The baths, from which the city originally derived its chief reputation, consist of 1. The king's bath, which is 65 feet 10 inches by 40 feet 10 inches, and contains upwards of 364 tons of water, the heat of which varies from 116° to 100° in the coolest part. The private baths in Stall Street, in connexion with the above, were erected in 1788, by Thomas Baldwin. The reservoir used for cooling the water, was erected in 1833, and is 45 feet by 25 feet, by 4 feet 8 inches deep.

2. The queen's bath, adjoining, is 25 feet square, and is supplied from the king's bath.

3. The hot bath, 56 feet square, together with the royal private baths in Hot Bath Street, were erected in 1776 by John Wood, jun. The latter are seven in number, fitted with white marble and glazed tiles, etc.; each bath contains about fourteen hogsheads of water. The tepid swimming bath was designed by Decimus Burton of London, in 1829; it is of an oval shape, 60 feet by 21 feet. The pump room adjoining was erected for the corporation in 1792, by John Palmer.

4. The cross bath was rebuilt by Thomas Baldwin about 1790; the pump room is now converted into three apartments with reclining baths. The heat of the water varies from 96° to 94°.

5. The duke of Kingston's, or the Roman baths, are supposed to have been constructed 54 B.C. They were discovered in 1755, when the priory was pulled down and the present building erected, consisting of four private baths.

The first pump room was built 1704, and enlarged 1751; Thomas Baldwin added a portico in 1786, and a new western front in 1791. The present structure was erected in 1796; it is 85 feet long, inclusive of a semicircular recess at each end, 46 feet wide, by 34 feet high.

The Bath or general hospital, Union Street (Roman), provides for 133 patients, and consists of 100 feet frontage by 90 feet depth. The first stone was laid 6 July 1738, and the building, designed by John Wood, sen., was opened 12 May 1742. One of the boundaries of the burial ground attached is formed by a part of the old city walls, which was repaired in 1849. S. John's hospital or the Blue Alms, near the cross baths, was erected 1728 by John Wood, sen.; the chapel adjoining was erected 1716 by William Killegrew, at an expense of about £540. The United Hospital, Bean Street, erected 1824-6 for 100 patients, was designed by John Pinch, at a cost of £7,000; the chapel erected in 1849, by G. P. Manners, cost £340. The Black Alms, Bimberries, or hospital of S. Catherine (plain Tudor), founded 1552, consists of fourteen tenements; it was rebuilt and enlarged 1829, by G. P. Manners. The Eastern Dispensary, Cleveland Place, erected in 1845 by H. E. Goodridge, is given in the *BUILDER*, vii, 160. S. Mary Magdalen Hospital, Holloway, is a small hospital for idiots, founded in the twelfth century, with a chapel (Perpendicular) annexed, which was rebuilt by prior Cantlow in 1495. It was repaired and the hospital rebuilt in 1760, and again restored in 1823. Partis's College, on Newbridge Hill, was founded in 1824, and consists of thirty dwellings and a chapel, erected by S. and P. Flood Page of London. The chapel and the house of the Bath Penitentiary in Walcot Street were enlarged in 1845, and the present frontage erected, by James Wilson, F.S.A.

The old town hall and market house were pulled down in 1777, upon the erection of the present guildhall, one of the most elegant buildings in Bath: it was commenced 11 February 1768, and then stopped: fresh plans were prepared in 1775 by Thos. Warr Attwood, city surveyor, and the buildings continued after his death by Thomas Baldwin, who succeeded him in his office, on a new plan. It consists of the usual offices for a mayor, with a ball or banqueting room, 80 feet by 40 feet, by 31 feet high, placed on the first floor: the front has a pedimented portico of four Composite columns on a rustic basement. The city bridewell, in Grove Street, now forms the police barracks. The new prison, on the Bristol road, was erected in 1843, by G. P. Manners, at a cost of £22,000.

Among the literary and educational establishments may be enumerated King Edward VI's grammar school, Broad Street, the present edifice was erected in 1752, by John Wood, sen.; Grosvenor college, erected in 1793; Bath proprietary college, instituted in 1853, occupies the building formerly known as the Sydney Hotel, erected in 1794, by Harcourt Masters; the new Kingswood schools, or Lansdown college, as it is now called, for the sons of Wesleyan ministers (Early Tudor), erected in 1851, by James Wilson, F.S.A., at a cost of £16,000, for 150 students; it is described in *CIVIL ENGINEER*, ii, 445, and xiv, 337. The blue coat schools, for 60 boys and 60 girls, in 1722, for £1,000, by William Killegrew; the national schools, Weymouth Street, in 1816, by John Lowder; the Walcot parochial school, Guinea Lane, by James Wilson; and the Trinity parochial schools, 1854, by Messrs. Wilson and Fuller. The Royal Literary and Scientific Institution was erected in 1823-5, by G. A. Underwood, on the site of the Lower or Kingston rooms, which were destroyed by fire 21 December 1820, the Doric portico erected by W. Wilkins, R.A., in 1810, being retained. Here are collected many of the antiquities found in the city, as also a very valuable library and museum. The reading-room is

considered to be the most elegant and commodious in the west of England. A group of five houses on the east side of Milsom Street, decorated with Corinthian columns, were erected by T. Baldwin in 1783; the centre house having been erected for the Somersetshire bank. The savings bank, shown in *Companion to the Almanac* for 1842, was erected in 1840, by George Alexander of London.

The places of amusement consist of the new assembly, or upper rooms, erected by John Wood, jun., at a cost of £20,000. They were commenced 24 May 1769, and opened in 1771. The ball room is 107 feet long, 43 feet wide, and 43 feet high; the card room, 68 feet by 43 feet; the octagon reception room, 48 feet diameter; a tea or concert room, 72 feet by 27 feet; and an octagonal vestibule, 28 feet diameter; with billiard rooms, etc. They are all on the ground floor. The new theatre royal, in Beaufort Square, opened 12 October 1805, was erected by John Palmer, from a design by George Dance, R.A. (*BUILDER*, v, 335.) Its size is 125 feet by 60 feet, by 70 feet high. Sydney Gardens, Great Pulteney Street, opened in 1795, was designed by Harcourt Masters; the Royal Victoria Park, opened in 1830, was laid out by Edward Davis; the column therein was erected 1837, from a design by G. P. Manners.

The S. Lawrence or old bridge, consisting of five stone arches, was rebuilt in 1754; it has lately been widened by galleries on each side of the bridge. Pulteney bridge, of three stone arches, erected about 1770, is curious from having houses erected on each side of the roadway; Bathwick or Cleveland bridge of iron, erected by H. E. Goodridge, was opened 28 September 1827; North Parade iron bridge was opened 10 November 1836, by W. Tierney Clarke, engineer. There are three suspension bridges: one near Grosvenor Place, 1830, by T. Shew; another by Norfolk Crescent, connecting the two Bristol roads, 1836, by — Dredge, engineer; and a third further down the river, 1837, by — Motley, engineer. Of the two bridges erected for the Great Western Railway, S. James and the Skew bridges, the latter is built at an acute angle across the river, and is considered a masterpiece of engineering. The railway station was erected in 1840, under the superintendence of — Frere, and is in the style of the period of James I.

The cemetery, consecrated 28 April 1848, on Lansdown Hill, has been formed in the grounds formerly belonging to Mr. Beckford, for whom the tower, 154 feet high to the top of lantern, was erected 1825, by H. E. Goodridge, who has since added a Byzantine archway, etc., for the entrance to the cemetery. The tower, etc., is well described in the *Illustrated London News* for 1845, vii, 324, 344, and 364, when its contents were dispersed by auction. The Abbey cemetery in the vale of Lyncombe, was commenced 30 January 1844; the chapel (Anglo-Norman) was erected by G. P. Manners, whose original design included cloisters, so as to form three sides of a quadrangle.

In the vicinity of Bath are numerous villas and mansions of much celebrity. Amongst these Prior Park claims pre-eminence; it was the seat of Ralph Allen, Esq., before mentioned. It is of Bath stone, erected by John Wood, sen., in 1743. The principal façade was nearly 150 feet, with two sweeping pavilions and two wings of offices, altogether forming a continued frontage of 1300 feet. A six-columned portico stands on a rusticated basement. Some of the additional buildings were erected by L. Brown in 1765 (façade given in *UNIVERSAL MAG.*, vol. xiv, p. 193). The estate was purchased in 1829 by the Roman Catholics for a college. Under H. E. Goodridge have been added spacious dormitories, an elegant but small theatre, and an observatory, to the right wing; on the left, in lieu of the stabling, there is now a range of apartments for the professors, etc., with lecture rooms. A terrace, fountains, botanic gardens, etc., have followed in succession, which, together with a chapel, form this domain into one of the lions of the west of England. The bishop's residence, library, chapel, strangers' apartments, etc., were burnt down 30 May 1836. S. Mary's church was rebuilt

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by J. J. Scoles, 1844. In the grounds is a fine Palladian bridge, 42 feet long, erected by J. Wood, consisting of three arches, and two more to support the steps.

WARNER, *History of Bath*, 4to., Bath, 1801; and *Excursions from Bath*, 8vo., Bath, 1801; *The Original Bath Guide*, 12mo., Bath, of various dates; *Graphic Illustrations*, Nos. 1, 2, and 3, fol., Bath, 1845; J. C. NATTES, *Bath Illustrated*, fol., London, 1806; EGAN, *Walks through Bath*, etc., 8vo., Bath, 1819; BRITTON, *Architectural Antiquities of Abbey Church*, 4to., London, 1825; ENGLEFIELD, *Antiquities of Abbey Church*, fol., London, 1798; WOOD, *Descr. of the Hot Baths*, fol., London, 1778; SEALY, *Architecture, etc., of Bath*, fol., 1843; TUNSTALL, *Rambles about Bath*, 8vo., Bath, 1847; BECKFORD, *Lansdown Tower*, fol., Bath, 1844. For the antiquities see POWNALL, *Descr., etc., of Roman Antiquities discovered in 1790*, 4to., Bath, 1795; WARNER, *Illust. of Roman Antiquities*, 4to., Bath, 1797; LYSONS, *Remains of Two Temples*, etc., fol., London, 1802; ENGLEFIELD, *Antiq.*, in vol. x of *ARCHÆOLOGIA*; WOOD, *Description of Bath*, 2nd edit., 8vo., London, 1749.

J. W.

BATH. The receptacle of a fluid for the purpose of bathing. The single hot or cold bath is a matter of much difficulty, as will be seen when it is considered that the characteristics of a good bath are strength sufficient to avoid its being brittle; freedom from oxidation or corrosion; impermeability both in the material and its joints, if any; preservation of the surface, whether polished or painted; facility of cleaning; and lightness of colour. Marble, cast iron enamelled, opalized glass, and glazed earthenware, when made without joints, chiefly fulfil the above conditions, as zinc, lead, copper, iron even if galvanized, and slate, all require a coating of light-coloured paint, so as to render easily apparent any want of cleanness in the water; and if not painted, all metal baths require considerable friction to appear clean. The difficulty of making a bath with joints that shall not leak is self-evident. The Buxton baths (1853), and many others, are lined with Rufford and Finch's patent glazed porcelain bricks, bonded in with ordinary brickwork for the sides. The bottoms are formed with veined Sicilian marble, and the whole of the private baths are made of the same marble. *BUILDER Journal*, xi, 535. The external dimensions of Rufford's porcelain bath (which is not too large for healthy persons, but too small for invalids) are on the top 5 feet 5 ins. long, by 2 feet 6 inches wide at the head, 2 feet at the foot, and 1 foot 11 inches deep, the thickness of the material being 2½ ins.: the weight is about 7 cwt. The plunging bath, which allows of a dark lining, is easily constructed according to its position, proper drains being formed to provide for the contingencies of leakage. The lining (generally wooden) of the vapour bath closet, and of the douche bath or shower bath closet, is a matter which has not yet received so much attention as the means of supplying air and water to them. A simple and expeditious hand apparatus used in Italy for warming a small bath is illustrated in the *CIVIL ENGINEER Journal*, iv, 39.

The most obvious and least expensive mode of heating a bath in a moderately sized house is by the simple contrivance of a close boiler at the back of the kitchen range, and a flow and return pipe (with proper adjuncts), giving at all times command of hot water to the bath: thus using to advantage the excess of heat from the fire. The valves and fittings, which are also important portions of a bath, are described by MESSRS. ASHPITEL and WHICHCORD, in the *Detached Essay BATHS AND WASH-HOUSES*.

BATH HOUSE. A building expressly constructed for the reception of bath and dressing rooms. The present condition of public establishments of this nature has been treated in the *Detached Essay "BATHS AND WASH-HOUSES"*; it is therefore sufficient here to mention that illustrations of those at Goulston Square, London, by Mr. Baly; at Lambeth and at Bilston, by Messrs. Ashpitel and Whichcord; at Endell Street, London, by Messrs. Baly and Pownall; at Buxton, by Mr. Currey; and

at Vienna (the Dianabad), by Messrs. Foerster and Etzel, are given in the *BAUZEITUNG* for 1843, pl. 510, etc.; and also in the *BUILDER Journal*, ix, x, and xi; that at Maidstone by Messrs. Ashpitel and Whichcord is given in the *BAUZEITUNG*, plate 497, second series; and to add the following works: ASHPITEL and WHICHCORD, *Observations*, 8vo.; BAILY, *Statement and Appendix*, 4to., 1853; and Fox, *Plans*, fol., 1848. One of the first of this sort of erection was that popularly known as the Bagnio, built in Bath Street, Newgate Street, London, about the year 1679, by some Turkey merchants, as a place for cupping and for warm and vapour bathing; CUNNINGHAM, *Handbook of London*, 12mo., Lond., 1850, p. 27. The design of this building is attributed to Sir Christopher Wren; the floor is paved with marble slabs, and the sides up to a balustrade are lined with Dutch tiles; the dome is of brick ornamented with coffers executed in plaster, and its eye was originally the only means of obtaining light; *CIVIL ENGINEER Journal*, 1850, p. 349. It has been called Charles II's Bath; and another of the same kind, termed Queen Anne's, is described in the *ILLUSTRATED LONDON NEWS*, vi, 108, as existing in Endell Street, near Long Acre: the last named street seems to have been a favourite site for such establishments, which were termed *bagnios*, until the immoral practices for which they gave facilities rendered it impossible for any but the most dissipated to visit them. The name of *hummams* (in Spanish, *alhama*) was also given in England to such establishments, from the Arabic term *hammam*, a hot bath.

In the old French mansions, the bathing establishment was a detached building, and consisted of an antechamber, a sitting room, a bed room, a dressing room, a wardrobe, a water closet, a bath room, and a furnace and stoke hole: the addition of a garden to the plan was not unusual, and then the arrangement of the whole formed one of the most pleasing subjects for the fancy of the architect.

The greater number of the bath houses, generally called *grottoes*, erected in this country during the last century, have become disused; for as they were less dressing rooms than covers to a pool connected with a stream running through a park or garden, the excessive coldness of the water in them was found to be productive of serious illness to the bathers. Yet, with a national liking for bathing, and with provision made by the state and by wealthy individuals for extending the enjoyment of the luxury to the poorest of the people, it is remarkable that there are very few mansions, even when recently built or improved, which have a number of baths sufficient for the unrestricted use of the family and visitors; such an accommodation, which ought to be a necessity of life to the rich, might be constructed either in a commodiously arranged building, or placed as a distinct office beneath the principal roof, if not attached to the bed-chambers. *Companion to the Almanac* for 1854, p. 40, contains a good essay on Baths. The *BAUZEITUNG*, plates 13 and 202 in the first series, illustrates the baths at Ischl, and the 'Vauxhall' baths at Paris.

BATH ROOM. An apartment specially devoted to the purposes of bathing. Of this sort there are too few chambers even in large mansions; and in the general case of private houses of a moderate size, even when not situated near a public BATH HOUSE, the utmost luxury is a single dressing chamber (sometimes, but wrongly, made quite separate from the bath room), containing a triple closet: the vapour bath and the douche or the shower bath, with suitable linings, forming a closet in each of the corners, and borrow their light (if no other can be obtained), from the dressing room; while a central closet encloses the vessel used for a warm or cold bath. This should have a false floor, or still better a front balanced so as to turn down and form a nearly level floor, the upper side being lined to prevent the absorption of water, and carrying a false open floor upon battens. The lining should hang over the inside of the front, so as to discharge any water upon the *SAFE*, which should be put, for fear of accidents, to every bath, with a good fall to

a waste pipe trapped at both ends. The most convenient mode of arranging a bath room is by having all the apparatus together, for a common bath makes a complete safe to a shower and a douche bath, while the vapour bath is easily arranged by a steam pipe laid into a hole which would be both supply and waste to the bath. The combined apparatus placed in a recess would offer every convenience. The hot and cold water service pipes are supposed to be of $1\frac{1}{2}$ inch diameter each, and there should be a 2 inch waste pipe at about two inches from the top of the bath in case of accidents, besides the waste pipe to empty the bath. Great care must be bestowed upon the means of heating the BATH; if steam be generated in the pipes which supply the hot air or hot water, the concussions which will be produced in the pipes injure them and render them leaky; hence it is needful to provide that the pipes to baths, as well as cisterns, should pass only where a leakage would not be of much inconvenience.

BATH METAL is a kind of BRASS OR PRINCES METAL.

BATHS OF THE ANCIENTS, see *THERMÆ*, and the *Detached Essay*, BATHS AND WASHHOUSES.

BATH STONE. This material has been fully considered by Mr. C. H. Smith in the *BUILDER Journal*, 1845, p. 52; and the following notes indicate the general tenor of that communication. Bath stone, which is a species of limestone, has been called Bath oolite and great oolite, is of a cream colour, found along the south-west coast of England and on the shores of the Bristol Channel; but is chiefly quarried near the city of Bath in Somersetshire, where it occurs in beds from four to five feet in thickness, and is distinguished by the names of the several quarries: the Box stone from the Bath-Baynton quarries, used about the beginning of the last century in the houses of Queen Square at Bath, where it certainly is not much decomposed, is the coarsest, hardest and most expensive, as well as most durable variety; the Combe Downe stone from the Bath Lodge Hill quarries, which is softer and finer grained, is said to have been employed between 1808-1821 in the repairs of Henry the Seventh's chapel at Westminster; and the Farleigh Down stone, from the Monckton Farleigh quarries, which may be sawn dry and rapidly decomposes, is stated to have been employed in the works from 1821 to 1840 to the north side of Westminster Abbey. Several public edifices and many private buildings have been erected in various parts of England with this, one of the most fragile of freestones, on account of its cheapness, for when first quarried it is as soft as cheese; although it hardens to some extent in the open air, yet it soon disintegrates, as it consists only of minute globules cemented together by yellowish earthy calcareous matter, and contains a considerable portion of broken shells. SMITH, *Lithology*, given in Transactions of the Royal Institute of British Architects, pt. ii, 4to., London, 1842.

BATRACHOS and **SAUROS** are ranked as Lacedæmonian artists, who erected in Rome the temple to Jupiter (or Apollo, as sometimes stated) and another to Juno, which were enclosed by the porticoes of Octavia; on which part of their history MEYER *ad Winkelmann*, vi, pt. 2, 281, observes that they lived in the first century of our era, as the porticoes were built B.C. 33. "Some think that they were excessively rich, and constructed these buildings at their own expense, in the hope of a commemorative inscription; which being denied, they nevertheless carried their point in another way. There are indeed at the present time a lizard," *sauros*, "and a frog," *batrachos*, "sculptured upon the bases (in spiris) of the columns;" PLINY, *Hist. Nat.*, xxxvi, 4; THIERSCH, *Epochen* 3, note 96; HIRT, *Annal. Crit. Lit. Berol.*, 1827; *Geschichte der Baukunst*, 244. The eighth column in the nave of the church of S. Lorenzo fuori le Mura at Rome, has an Ionic capital in which the reptiles above mentioned are well executed, being introduced in the volutes; but it is contended that this fragment is of later origin. In 1771 there were some of these columns and their stylobate in the monastery of S. Eusebio; and according to



PALAZZO DELL' UNGHERIA.



GWILT, *Encyc.*, the pedestals, sculptured with a lizard and frog, still remain.

BATON, BATOON, or BATTOON, also improperly written BASTION and BASTOON, from the old French word BASTON. A name given to the torus between the listel or fillet and the plinth, in the base commonly assigned to the Roman Doric order.

4.

BATTEN. The old use of this term, which has not entirely yielded to the recent application of the word, was the name given to a scantling of wooden stuff, from two to seven inches broad and from five-eighths to two inches thick, the length being undetermined but considerable, by carpenters and joiners when speaking of doors and shutters which were made to appear as if pannelled, by means of these pieces or battens bradded upon plain boards, which were joined together for the door or shutter, all round and sometimes across and along them according to the intended number of panels; some molding being usually struck, as a bead, an ogee, or the like, on one edge of those pieces which represented the stiles, and the upper and lower rails, and on both the edges of those which were designed to represent middle rails and stiles. BATTEN-DOOR.

The usual modern use of the word is for deal 7 inches wide, the thicknesses imported being $2\frac{1}{2}$ and 3 inches, and they are sold at per 120, in the same manner as DEALS, and these thicknesses suffice to make two and three boards in thickness respectively. The quality of battens is divided into three sorts; the best being free from shakes, knots, sapwood, or cross-grained stuff; the second being only worse by having small but sound knots; and the third being the refuse after the above pickings. When not so much as six feet long, as imported, they are called batten-ends. The *CIVIL ENGINEER Journal*, 1843, p. 407, observes that "the best yellow battens are imported from Christiania; a large number of both white and yellow battens were formerly imported from Longsund in Norway, but battens of this description are now imported from Dram; they are from about $6\frac{1}{2}$ to $6\frac{3}{4}$ ins. wide. The white especially are of an excellent quality, and so are such of the yellow as are not sappy; the sappy ones preponderate in number, and on account of their cheapness are frequently used as a substitute for timber in building the smaller descriptions of houses. The next in quality to the battens of Christiania and Fredericstادت are those which are imported from Archangel and Onega, though few have of late come from the latter port. Yellow Archangel battens cost usually somewhat more per Petersburg standard than the 11 inch planks. Both Archangel and Onega battens have the defect of having black bark round the knots, the wood of which is dead, whereas the knots of Christiania wood are bright and firmly united to the substance of the tree. Yellow battens are also imported from Petersburg, considerably inferior in the quality of the wood to those of Archangel and Onega;" but there is an old established opinion that Petersburg, Onega, and Christiania battens are fit for the best floors, and Christiania for framing: the Gottenburg bear at the present time a rather lower price than the Russian, as causing more waste, being generally sappy. BALTIC TIMBER.

1. 4. 14.

Batten is also used for the appellation of a piece of deal not more than $3\frac{1}{2}$ inches wide, and even so little as half an inch in thickness, if in length above six or seven feet.

BATTEN DOOR. A door formed, in an old manner not yet entirely disused, of a ground work of jointed and glued-up boards, cut to the full length and breadth required, and planed up on their faces. BATTEN pieces, in the old sense above explained, being nailed as rails and stiles on the front side of the boards, complete a single batten door; in some few cases double batten doors are made by rails and stiles affixed on both sides. Double doors, or double battened outer doors, are made of whole deal, battened as above on the outside; while pieces of 4 or 5 ins. broad being mitred round the edges on the inside of the door, SLIT DEAL is used as a lining across the door, between and flush with the inside batten pieces. In 1735 it was not usual, but had

been tried, to line the ground work "with pieces put bevilling, and not at right angles, but near mitre to the sides of the door or window (shutter), and when all has been planed off level, it has been divided out in rhombs, and struck with a pencil, and at the angles of the rhombs were round-headed nails driven, which added something to the beauty of the work. This way of lining upon the doors, namely, pointing from the lower corner behind to the upper corner before, may be a good way to prevent a door from sagging or sinking at the fore-corner, whenever the joints shall happen to unglue." NEVE, *Dict.*, 8vo., London, 1735. DOOR; CLAMPED DOOR; LEDGED DOOR.

BATTEN ENDS, see BATTEN.

BATTEN SHUTTER, see BATTEN DOOR.

BATTEN FLOOR. This term has been employed until within a few years, merely to denote that a floor was laid with boards a little less than 7 inches wide, in the same manner as with deals: but during the last fifteen or twenty years it has been applied to a mode of casing a floor already boarded, with thin battens not more than $3\frac{1}{2}$ inches wide.

2.

BATTENING. Battens fixed to walls for the reception of laths for plastering, of canvas for papering (Fr. *bâties de tenture*), or of boarding for lining: they are generally about $1\frac{1}{2}$ inch thick and 3 inches wide, but they have been used so small as three-quarters of an inch thick and about $2\frac{1}{2}$ inches wide, according to the distance at which they are fixed, which should be about 12 inches from centre to centre taken horizontally for laths, and the same vertically for matched-boarding; they ought to be fixed at varying distances for canvas, rather according to the danger of fracture, than as usual to the tightness required. Great difference exists in the distances apart of the bond timber, bond timber and plugs, or plugs alone, inserted into the wall for the purpose of affording means of securing the battens: in some cases the battens are fastened to the wall at every twelve inches of their length, in others at about every three feet, without much regard to the old rule of increasing the strength of the batten according to the distance of its points of fixture. Plugs are chiefly employed where the mortar containing alum, salt, etc.; or exposure to driving rains; or moist foundations, render the walls damp; as the plugs can project an inch or more from the wall, and leave a place for the circulation of air. DRY ROT. When battens are fixed against flues (a practice which is objectionable, even when the flues are protected by tiles in cement, or by other means), iron holdfasts should be used instead of plugs or bond timbers. The act and the method of fixing the battens is also called battening.

1. 2.

BATTER (Fr. *fruit*). A wall is said to batter when one or both of its faces are made receding from the perpendicular, the wall getting thinner from the base upward; this is sometimes done only for the sake of appearance, or of economy; at other times it is done that the wall may resist the pressure of high winds, the weight of water, or the thrust of a body of earth: in which last cases it becomes necessary to calculate carefully the amount of the pressure that may be exerted against it. EMBANKMENT WALL; RETAINING WALL. There are three kinds of battering walls, the plain, A; the curved, B; and the offset or stepped, C. The reverse of battering is called overhanging or BEETLING.

2.

BATTISTIS (ANTONIO DE) designed the *palazzo della famiglia* belonging to the Borghese family, situated opposite to their great palazzo at Rome. FERRERIO, *Palazzi*, fol., Rome, 1700, pl. 69.

BATTLEMENT, BATAYLMENT, BATAYLMENT, BATILMENT, or EMBATTAILMENT (Fr. *crénelage*). The correct derivation and use of this word are among the difficulties of lexicographers; one of the most plausible origins is the old French building term *battellement* or *battèlement*, applied to the bottom edge of a roof, particularly when thickened by one or more extra courses of tiles. In this sense *battèlement* applied to a



parapet would simply mean a finishing like a tile coping or creasing, which when carrying an ornamented crest is called BRATTISHING: but custom has confined the use of the word battlements in the plural, to express the solid portions of a line of notched parapet wall, a definition which is supported by the terms *battellare et kinnellare* in the licenses granted by the early English sovereigns to their subjects for fortifying their dwellings: custom has also led to the use of the word battlement for the whole line of such an indented parapet above the footway behind it and the stringcourse in front of it. There is also a custom of calling the space or CRENEL and solid or COP a "loop and crest", whereas the CREST is the coping which is generally placed at the bottom of the space as well as on the top of the solid: and the term "loop and crest" is liable to be mistaken for a solid with an OILET, LOOPHOLE, or EMBRASURE worked in it, as may be seen at York.

The remote antiquity of battlements in the usual sense of the word appears from sculptures in the British Museum; those from Egypt are of the time of Ramses II (about B.C. 1150), fig. 1, which is technically termed *innecked*; and those from Assyria are of the time of Assurakbal I (about B.C. 900), and of Sennacherib (about B.C. 700); fig. 2, technically termed *indented*, is very common in the works of the time of both those monarchs; but the battlements of the date of the earlier sovereign, which are sculptured on a large scale, show the solid portions standing over a stringcourse, fig. 3; in some instances with a portion of wall between them, figs. 4 and 5; and also the peculiar sort which is technically called *battled-embattled*, figs. 6 and 7. The sculptures from Lycia show battlements somewhat resembling

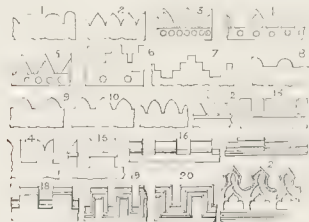


fig. 1, but which have a portion more or less of wall, as figs. 8, 9, 10, between the solids, which seem in some cases to be meant to seem positively pointed, as in fig. 11. A slab of Assyrian sculpture belonging to the period of Sennacherib, contains the sole representation of the form, fig. 13, as a cut battlement, whereas it might have been supposed the one most familiar to the sculptor, who has frequently represented carefully the *indented* pattern as an ornament in relief, fig. 12, upon a parapet. Some remains of high antiquity, sketched by ALLASON at Messene, and given in the *Antiquities of Athens*, fol., London, 1830, iv, as Greek battlements, and others adduced by MAZOS, *Ruines de Pompeii*, iii, pl. 12, 13, might pass for vestiges of the mediæval period.

Were there not examples in Italy of battlements plain like the English ones, fig. 18, at Siena, Lucca, and Bologna; forked as fig. 14 at Piacenza and Ferrara, and fig. 15 at Verona; the well known brattishing on the ducal palace at Venice; and the remarkable finishings given in the view of the west front of the cathedral at Cefalù, by GALLY KNIGHT, *Illustrations*, fol., London, 1800, it might almost be said that England is the only country in which to look for examples of this sort of parapet, as it hardly appears except as steps to gables in the buildings of Lombardy, Germany, France, or Spain: it should be added that the Mahometan invaders have left in the last named country one of their peculiar forms of battlement, like the last but two of the accompanying sketches, of which those numbered 1 to 11, from KIRTOE, *Illustrations*, fol., Calcutta, 1836, form the groundwork of interesting comparisons between this kind of ornament as seen in India, and those found in

other countries: fig. 12 is from Beejapore, and figs. 13, 14, and 15, from Cairo.



In Great Britain the early battlement consisted of square crenels, as shown in books illuminated before the Conquest, and in the existing keep of Rochester Castle (1122-1136), which is perhaps the only certain specimen of a Norman battlement, though others consisting of a parapet with a narrow and deep crenel at intervals, may have a claim to be considered original and of that date; a battlement with equal intervals occurs in small ornamented works of the later part of the First Pointed style; the crest of the solid portion is formed by a coping sloping from the centre to the front and back, and covering exactly the whole length of the parapet wall, as if the pieces in the crenels had been cut off of the crest and dropped down into their place, which is sometimes very much below the level of the bed of the crest on the cop; but in the fragments of Waltham Cross there appeared to be an exception, as seen in fig. 16, the crenel having a chamfer without moldings (this arrangement is perhaps more usual in France), and not situated altogether below the bed of the crest on the cop; in which last respect the battlement belonging to the Second Pointed style, at Great Addington in Northamptonshire, fig. 17, fully rivals it. In this style it is not unusual to find the parapet pierced; but it is in Perpendicular work that the student will find a store of hints, some of which are not less curious than the Indian examples above given. The face of the earliest parapets of the Perpendicular period is generally ornamented with quatrefoils, etc., as at Loughborough church in Leicestershire, or quatrefoils, etc., over panels; but in the later examples, two ranges of panels are introduced. In this style the battlement became a leading feature of ornamentation in small works, and was not only planted on the transoms of windows and beams of roofs, but even on the chamfers or set-offs on buttresses, as at Loddon church in Norfolk.

There are three leading divisions of battlements in English Gothic architecture; fig. 18 shows the space and solid crests, fig. 19 shows a small molding running up the sides of the solid and under both crests, and fig. 20 shows the capping continued all round, vertically and horizontally; this is the latest, and its construction is accurately defined by HOLMES, *Accidence of Armory*, fol., Chester, 1688, iii, 472, as made of "wheelers or wrought stones that lay level and straight, yet make outward angles when other stones are joined to them, and kneelers, which are stones that stand upright, and make a square outward above and inward below": to this last class belong the curious example at Northampton Cross, fig. 21, and perhaps such combinations of the Tudor flower with a parapet as that over the door in the south aisle leading to the cloisters, in the abbey church of St. Albans in Hertfordshire. The variations however of floriated, gabled, and other battlements, as well as the combinations of battlements with stepped and other gables, pinnacles, etc., seen in the finer churches of the later Gothic, as Bishop's Lydiard, in Somersetshire; Louth in Lincolnshire; and Bitton in Gloucestershire; Cromer and Filby, in Norfolk; Woolpit and Blithborough in Suffolk; and at the east end of Peterborough cathedral; on the tombhouse at Windsor; on the central tower of Lincoln cathedral; with those on the nave and aisles of King's College chapel at Cambridge, are well worthy of careful examination. Statues on battlements as at Alnwick,

Chepstow, and York, are paralleled by other examples on the continent. 16.

BATTLING, BATALLING, BATAYLING, see BATTLEMENT.

BATUTA. The native name of a compact and heavy wood used in the West Indies. 71.

BAUER (HANS) of Ochsenfurt, between the years 1459-77, carried out as *baumeister*, in conjunction with Conrad Heinzelmann of Ulm, the designs left by Conrad Roriczer for the Lorenzkirche at Nuremberg. 92.

BAUG. A small town on the road by the Oudipore Pass from Guzerat to Malwa in India. It is remarkable for the cave temples, which have been described by DANGERFIELD, in the *Transactions of the Literary Society of Bombay*, 4to., London, 1820, ii, 194, with details which are calculated to arouse the cautious attention of the European artist; and by FERGUSON, *Illustrations of the Rock-cut Temples*, 8vo., London, 1845, pp. 27 and 37, who notice the unusual position of the DAGHOPA or CHURNA, in each of two finished sanctuaries. The largest excavation, being a vihara or monastery cave, surrounded by *dookans* or cells for the worshippers of Buddha, would have been a cave, 81 feet square and 14 feet 6 inches high, with twenty pillars, five of which have been destroyed, but owing to the presumed badness of the rock four extra pillars (another deviation from established rules) have been left in the centre of the hall.

BAUHINIA PORRUTA, or mountain ebony, as it is called in Jamaica, because the wood is sheathed with black, is a small but strong timber tree, also obtained from the woods of Arcot and Tennasserim in the East Indies, where it is called *aree*.
BUCHANAN, *Journey*, 4to., London, 1807, i, 27. 14. 71.

BAUK, BAULK, and BAWK, are improperly written for BALK.

BAUME (ABBÉ GAUZON DE), a Cluniac monk, gave in 1089 the plan for the existing church (dedicated in 1131) of the celebrated monastery of Cluny in France, to which he then belonged. CUCHERAT, *Cluny*, p. 104.

BAUME MARBLE (SAINTE). A name given to two sorts of marble; one being a BARIOLE, white, red, and yellow, not unlike Spanish brocatello, and found in the department of the Bouches du Rhone; the other, or true Ste. Baume, worked in the mountain so called in the department of the Var, is red veined with white, like LANGUEDOC MARBLE, with which it is often confounded.

BAUTISTA DE TOLEDO (JUAN), see TOLEDO (JUAN BAUTISTA DE).

BAUTISTA (EL HERMANO FRANCISCO), designed about the year 1630, for the Company of Jesuits to which he belonged, the royal church of S. Salvador del Mundo, belonging to their house for novices at Madrid. He also designed the other royal church of S. Isidro in the same city, belonging to the *Colegio Imperial* of the same Society, begun in 1626, although not finished until 1651. In both edifices he used a Doric order, but added Corinthian leafage to the capitals: and in the last named edifice he set the fashion in Spain of erecting wooden cupolas and similar works, finished externally by the joiner and carver, and internally by the plasterer. In 1632 and 1647 he was summoned to Toledo, to give his opinion as to the works in progress and proposed at the capella del Ochavo in the cathedral: and in 1653 he arbitrated upon the accounts furnished for the erection of the cloister and dormitory of the south portion of the convent of S. Felipe el Real. The date of his death is unknown, but it must have been in, or subsequent to 1677, the date of a report made by him to the Council of State. 66.

BAUTRINIA SUTRA (*tukra*) produces a close-grained, soft, tough, yellow wood, and B. bacuria (*bakuri*) an open-grained, soft, tough wood; both species are obtained in the woods of Gualpara, East Indies, and used in building. 71.

BAUTZEN, BUDDISSIN, BUDISHYN, or BUDISSIN. The capital of the circle of Upper Lusatia in Saxony. The city, which is situated on the left bank of the river Spree, is well built, having broad, straight, and well paved streets, with large and rather

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heavy looking houses. The cathedral, built in 1213, is a large edifice, with a very lofty spire, and a fine chapter house; the church itself is now divided by a screen, one-third of its length, that next the high altar being used by the Roman Catholics, and the remainder by the Protestants. The palace of Ortenburg, burnt in 1440, and rebuilt by king Matthias of Hungary (1458-1496), is now used as public offices. The other leading buildings of any importance are a vast modern Gothic *Rath-haus* or house of assembly for the states, a town hall with a public library, four churches, six hospitals, and two colleges. 50.

BAWK, sometimes improperly written for BALK.

BAWN. A word, originally Irish, signifying a fortified enclosure. In accepting grants of government leases of land in Ireland during the reigns of Elizabeth and James I, the undertakers to settle the country engaged to construct a castle and a bawn, or area enclosed by walls, with flankers (for the protection of the cattle of their tenants from the attacks of the "rapparees"), the dimensions of the bawn, adapted to the extent of the grant, being specified in the instrument. The word is now applied in some parts of Ireland to the field near the farm house, into which the cattle are regularly driven to be milked. BAILEY. R. R. H.

BAY. A word derived, like the corresponding modern French *baie*, from the old term *bée*, which is still in use amongst the Parisian workmen, and evidently belongs to a set of words related to the verb *bêre*, an almost disused mode of spelling *bayer*, to gape. The original employment of the French word seems to have been to indicate a gap or open space; and this meaning has been preserved in England.

DALLAWAY, *Discourses*, 8vo., London, 1833, gives the following explanation: "A bay in architectural acceptance is a quadrangular space over which a pair of diagonal ribs extend, which rest upon four angles. The same term is also used for the horizontal space comprised between two principal beams." The term has also been applied to any principal compartment or division of work when it lays between fixed features, as piers, or even the screeds used by plasterers; thus a BAY OF FLOORING OR OF JOISTS (Fr. *travée de plancher*) is the term applied to the space filled by the joists contained between two binding joists, or between two girders when there are no binding joists; the battens or boards are not included: in like manner also a BAY OF ROOFING (Fr. *travée de comble*) is the term applied to the space occupied by the purlins and small rafters contained between two principal rafters; the laths, battens, or boards, are not included. It is extended even to the space forming the end or head of a barn, for if a barn consists of a threshing floor and two heads to hold the corn until threshed, it is styled a barn of two bays; a larger barn may have three bays, and when the bays were not above 16 feet in length, it was common for the large barns of former times to consist of several such bays. Workmen also apply the term bay to the space between two mullions, but a more correct word in the last case appears to be DAY, a literal translation of the French term *jour* for such an opening, but supposed by some writers to be a corruption of bay. 1. 2. 4. 17.

BAYARD was *ingeniator* at Nottingham Castle in 1205-6. HARTSHORNE, *Paper* read at the Royal Institute of British Architects, 6 May 1850.

BAYEUX (the Latin AUGUSTODURUS, BAJOCÆ, BAJOCAS, or BODIOCASSUM). A city situated on the river Aure, in the department of Calvados in France. The houses, chiefly built of timber and plastered, have a peculiarly singular appearance, but there are some of stone standing in the large *places*, and in streets which, except the principal one, are narrow and irregular, and thereby add to the picturesque effects of these specimens of mediæval domestic architecture.

The splendid cathedral of Notre Dame and S. André, replaces a still more interesting structure; its crypt under the choir supported by twelve pillars, with rudely worked capitals, and containing some episcopal tombs, is perhaps the only com-

plete vestige of a church dedicated in 1077, in the presence of the archbishops of York and Canterbury, and of king William I. of England, burnt in 1106, and restored in 1159 by bishop Philippe de Harcourt. The west end of the nave still shows rich piers belonging to the eleventh century, according to BOURASSÉ, *Cathédrales*, 8vo., Tours, 1843; over these a trefoiled blank arcade occupies the place of the triforium, and is surmounted by a range of tall First Pointed windows. Bishop Henry de Beaumont, an Englishman, added in 1205 the east end of the nave and the choir, which with the apse are also of the First Pointed style. The building is 315 feet long by 105 feet wide, and 81 feet high inside. It exhibits on its exterior several anachronisms; the two towers at the west end have spires of very late date, only the northern tower was built at the same time with the church; the southern one was the work of bishop Nicholas Habard in 1424, but it was so often damaged by lightning as to have been nearly rebuilt in 1746. The centre of the cross is occupied by a cupola surmounted by an open lantern; but this anomalous addition of the year 1714-15 is concealed from the interior. The oak stalls, the screen of the same style as the cupola, the *flamboyant* chapels in the side aisles, and the exterior of the east end, merit close examination: the façade with its five porches is curious, the two next the central one have only plain moldings, while the others have been elaborately enriched; they belong, like the transepts, which are 120 feet long and 35 feet wide, to the style *Ogival secondaire*, but the south portal of the church is in that of the transition from Norman to Early Pointed work. A very clear plan is given by LABORDE, *Monuments de France*, etc., pl. 157-8, fol., Paris, 1840. SOMMERARD, *Album*, 4th series, pl. 6, gives picturesque views from the south-west and the south-east, in which the lantern appears to advantage. The chapel of the *seminaire*, now the *hôtel-dieu*, built in 1206, with lancet double windows and a groined roof, is described at considerable length by WHEWELL, *Architectural Notes*, 8vo., Cambridge, 1842, page 297. The *hôtel de ville* contains the celebrated piece of needlework called the Bayeux tapestry. The episcopal palace was repaired by bishop Bernardin de S. François (1573-1582), who also completed a chapel and the library begun by bishop Luigi Canossa (1517-1531). Three seminaries and an hospital were erected by bishop François de Hermond (1662-1715). DELAUNÉY, *Bayeux et ses Environs*, 8vo., 1809. 28.

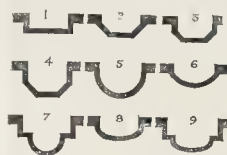
BAYONNE (the Latin BAIONA). A fortified city and seaport situated at the confluence of the rivers Nive and Adour, in the department of the Basses Pyrénées in France. The town is separated by the Nive into two portions, called Great Bayonne, containing the old castle on the left bank, and Little Bayonne, containing the new fortress on the opposite side, but connected to it by the Mayou and Paneco bridges; while the suburb of S. Esprit, situated upon the Adour, in the department of Landes, contains the citadel and port. The architectural character of the houses is more Spanish than French, as there are arcades and colonnades under the fronts of the houses; they are built of stone, from three to four stories in height, and placed in narrow and irregular streets, with lattice windows and balconies, over which cloth blinds are drawn; the shops are open in front like booths.

The cathedral, dedicated to the Virgin, is a small structure, ugly externally, but lofty inside: the choir and apse belong to the twelfth century; according to BOURASSÉ, *Cathédrales*, 8vo., Paris, 1843, their style is *Romano-Byzantine*; the transepts are exceedingly short; the aisles of the nave and part of the tower belong to the style *Ogival secondaire*, and the remainder of the tower to that of the *Renaissance*. The cloisters are of late date, and are reputed to be nearly the largest in France. The city possesses, besides dockyards, a noble quay, with brightly painted houses, and an avenue of trees as an *alameda*; a custom house and a theatre in the *place de Grammont*, the handsomest and most modern quarter of the town, with the above named rivers on two of its sides; a mint; an arsenal, which is one of

the best and most complete in France; a military hospital for 2,000 invalids; an exchange; and two large public schools. 28.

BAY WINDOW. The general term for a window planned so as to form a recess out of the room to which it belongs. It is not clear whether the term is derived from its occupying a bay of the building (as between two piers), or the full width of the bay or opening left for it during the construction of the wall through which it is entered. Several adjuncts seem to have been introduced in order to classify the varieties of plan which such a window may present: as a SQUARE BAY WINDOW, fig. 1; a CANTED BAY WINDOW, figs. 2, 3, 4; a COMPASS BAY WINDOW, figs. 5, 6; a SQUARE AND COMPASS BAY WINDOW, fig. 7; a BOW BAY WINDOW, fig. 8; a SQUARE AND BOW BAY WINDOW, fig. 9, sometimes called a CABINET WINDOW: but the indiscriminate use of the words bay and bow, with the prevalence of the latter, led to such absurdities of diction as "square bow windows" and "compass bow windows". Bay windows are mentioned by CHAUCER, and by WILLIAM OF WORCESTER; they do not appear to have been used earlier than the Middle Pointed period, nor to have been curved on plan until that style had begun to lose its purity: indeed, compass bay windows were never so common as square or canted ones, until about the beginning of the present century, when bow and cabinet windows were in especial favour. The bay windows pertinaciously misnamed ORIELS, when employed, as they frequently were, in halls of the Perpendicular period, are invariably placed at one end, and sometimes at both ends, of the raised portion of the floor commonly called the dais since the times of MATTHEW PARIS and CHAUCER; and the lights generally are carried down nearer to the floor than in any other windows. 1. 2. 17.

BAZAAR. The term given in Persia, India, Egypt, and Turkey, to any MARKET, whether open or covered, unless its shops surround a principal area, when the latter keeps its peculiar appellation of MEIDAN. The open bazaar in those countries serves for the sale of animals and vegetables; and is not surrounded by any enclosing fence if situated outside the walls; but in the interior of any town the bazaar-street, or series of streets, is more or less covered. The approaches to it are generally mean streets lined with low shops, containing goods of little value, and sometimes open to the sky, but frequently covered by beams supporting matting or large leaves, or even branches: and such is frequently the *whole* of a mean bazaar in Persia and Turkey. With the exception of a shop at intervals for the sale of some sort of provisions ready dressed, the streets of a good bazaar exhibit to European eyes the rare spectacle of the mediæval congregation of shops of one trade, so that each street seems one enormous retail shop, having an attendant seated at a fixed distance from his fellows on either hand, and separated from them by a partition. These divisions form distinct shops, which are rooms with open fronts, from 8 to 10 feet high and about 6 feet wide, and rarely so deep from back to front: the best portions of a bazaar have, however, a door in the back of each shop leading to an equally small store-room; the floors are raised about two or three feet above the level of the pathway. The street, if of a high class, is covered by a vault perforated for the admission of light, and even by one or more domes, as in the two fine examples at Constantinople, of which the oldest was built in 1461, the other about the year 1700. Even in such streets single commodities are often exposed upon a stool, a basket, or a cloth placed on the ground. There is no place of residence in the bazaars; at close of day the shops are slightly fastened up, the bazaar is often secured by gates, and is generally well watched. These last features are the chief points of resemblance between the bazaars of Asia and those buildings which have obtained the same name in London, the first of which was opened in Soho Square at Christmas 1815;



the Pantheon in Oxford Street was converted to a similar purpose in 1839. But these buildings were not altogether novelties, except in name, and perhaps in the arrangement of the stalls not being visibly separated by partitions; as the old and new EXCHANGE in London had already existed as fashionable promenades for the purchasers of such articles of fashion or luxury as are now exhibited for sale in the English ARCADES or continental GALLERIES, which are equally as much bazaars as any Asiatic market. Remains of the mediæval arrangement or agglomeration of shops of one trade still occur in some of the Italian towns, as in the existing instances of the goldsmiths at Florence; and in the names of streets, such as that called dei Maestri at Siena, from the number of artists who formerly occupied it. In London similar traces remain in the names of some of the streets, as Lombard Street, Butcher Row, etc.; and Paternoster Row is a double row of shops chiefly devoted to the sale of books.

The term bazaar is used upon the continent both for a *galerie*, such as the handsome building erected by Averdick at Hamburg, and given in the *BAUZEITUNG Journal* for 1848, pl. 190; and for a *market* such as that at Warsaw, designed by Gay, and given in the same *Journal* for 1844, pl. 85. The first named, which is about 330 feet long by 60 feet high, is divided by a large octagonal lantern, and contains a range of lodgings over shops on the ground floor, lighted by a large semicircular glazed roof. The building at Warsaw surrounds a triangular area, and has front and back shops under colonnades: the greatest length is 423 feet, the width 237 feet, and the extreme height 42 feet. The mass of building at Antwerp called the *Cité*, is at present an example of a bazaar and an exchange combined. The *Bazar de l'Industrie*, in the *Boulevard* and *rue Montmartre*, designed by Lelong in 1830, is given by NORMAND, *Paris Moderne*, 4to., Paris, 1846. FORBIN, *Voyage en Orient*, fol., Paris, 1819, pl. 3, 10, 11. 14.

BAZAS. A city in the department of the Gironde in France. The only edifice possessing any architectural interest is the small but well proportioned cathedral, dedicated to S. John the Baptist, dating from the twelfth to the fourteenth centuries. It is remarkable for having no transcripts, for the number and lightness of its columns, for the purity of its style, and for the richness of the principal façade, of which the three portals were highly decorated with numerous statues and sculptured ornamentation; all these were much defaced by the Huguenots, who also so much injured the building that after 1605 it had to be repaired.

BAZHENOV, BAGENOV, BASCHENOV, or BASHENOV, sometimes written BASIMOV and BASMOV (VASILIY IYANOVITSCH), born at Moscow, March 1 (13), 1737, was sent in 1751 to the building school in Moscow, and in 1754 to the university in the same city, whence he was removed, on the establishment in 1758 of the Academy of Fine Arts at S. Petersburg, to the latter city, and was placed under the government architect Tschervakinsky. In 1761 he was sent by the academy as a travelling student to Paris, where he put himself for about a year under Duval, and would have obtained a gold medal from the Academy of Architecture, had it not been contrary to its statutes to confer the distinction on any but Roman catholics: he received a certificate of merit, upon which he became an associate of the Russian Academy, and received directions to proceed to Rome, which city he reached in October 1762. He was elected in 1764 a member of the Academy of S. Luke, and afterwards received the same honour from similar bodies at Florence and Bologna. On his return to S. Petersburg in May 1765, he became architect to the empress Catharine, who gave him subjects and ideas, some of which were hardly less magnificent than that of remodelling the Kremlin and all its buildings into an edifice four thousand feet long and two hundred feet deep, of which the first stone was laid 1 (13) June, 1773, on which occasion Bazhenov pronounced an oration, printed by mistake among the works of

Sumarokov. When this extravagant project was renounced (the model alone, which is still preserved, cost £9,500), the same sovereign in 1776 employed him to erect a summer palace at Tzarskoye (Tzartizano); but in eleven years afterwards, 1787, she ordered the greater part to be destroyed, and rebuilt from the designs of Kozakov. In 1792 Bazhenov was invited to S. Petersburg as architect to the Grand Duke Paul, on whose accession he received an estate, the order of S. Anne, and several official dignities. The academy possesses many of his drawings, being part of those which had been prepared after his death for publication. His chief buildings were the magazines and other similar buildings at Cronstadt, the improvements and enlargements of the palaces at Gatchina and Paulovsky, and the Hôtel des Invalides at S. Petersburg; the palace of S. Michael, now the college of engineers, and the Kazan church, in the same capital, are said to have both been from his designs: the latter is generally ascribed to Voronikin, who may have adopted a design by Bazhenov; and the former, designed and commenced by him, was executed by Brenna. He published a translation of VITRUVIUS in 4 vols., 4to., 1790-97; became a vice-president of the academy; and died of a paralytic attack, 2 (14) August, 1799, at S. Petersburg.

BEAD (It. *astragalo*; Sp. *astragalo*, *tondino*, or *junquillo*; Fr. *baguette*; Ger. *rief* or *stab*). The term applied to a molding, generally part of a circle in section, and of small size in comparison with its neighbouring moldings. Beads are, however, sometimes made of slightly elliptic and other sections.



When stuck or struck on the edge of a piece of stuff, as A, so as to form a rounded edge to the whole thickness, it is simply called a *half round* or *nosing*; when flush with the surface of the work with which it occurs, it is called a *flush bead*; but when it is relieved, as at B, it is called a *quirk bead* or *quirked bead*; when it has two quirks, as C, it becomes a *bead and double quirk*; or a *return bead*, as D, according to its position, and like the preceding instance is often found without the quirks, especially in works executed before the revival of Greek art in England. If raised above the surface, the bead is called a *cock bead* or *cocked bead*, as E and F. ANGLE BEAD; ASTRAGAL; BAGUETTE; BEAD AND REEL; DOUBLE BEAD; REEDING; STAFF BEAD; TORUS. 2.

The bead is capable of receiving various sorts of ornaments, such as ribbons, ropes, leaves, pearls, flowers, and even a sort of guilloche, and any of these may be combined in it with one or more of the others. CHAPLET; KNULLING; PATERNOSTER.

BEAD AND QUIRK, see BEAD.

BEAD AND REEL. A bead molding or ASTRAGAL, ornamented with pearls or olives, with one or more tongues between them. It is supposed to be the ASTRAGALUM LESBIUM of the ancients, and its antiquity is proved by the fact that this enrichment is of very common occurrence in the Assyrian sculptures, as noticed by SMIRKE in paper read at the Royal Institute of British Architects, March 1850. BAGUETTE.

BEAD BUTT WORK, commonly called BEAD BUTT. A piece of framed work, in which a bead, butting or stopping against the rails, is stuck or struck parallel with the grain on the upright edges of a panel, which is now (but not formerly) made flush with the framing, as G; the bead, however, is sometimes made separately and laid in.

BEAD BUTT AND SQUARE. A piece of framed work showing bead and butt work on one side and square work on the other, as H.

BEAD FLUSH WORK, commonly called BEAD FLUSH. A piece of framed work with a bead mitred all round a panel, the face of the panel being generally, but not always, flush



with that of the framing, as 1. The bead is either laid in separately all round, or only where it crosses the grain, the remainder being stuck or struck on the panel.

BEAD FLUSH AND SQUARE WORK. 1. A piece of framed work showing bead and flush work on one side, and square work on the other, as K, to which a bead or other molding is sometimes added for better work. 2.

BEAD PLANE. A plane, the iron and sole of which are hollowed out in a semicylindrical or other contour, for the purpose of sticking or striking the molding called a BEAD on a piece of stuff. The quirks to a bead are cleared out by a SNIPER-BILL PLANE. 1. 23.

BEAK, see BIRD'S-BEAK MOLDING; CHIN-BEAK and LIP.

BEAK. A small fillet on the underside at the bottom edge of the corona of a cornice, either left pendant, as in ancient masonry (VITRUVIUS, iv, 3, calls it *mentum*) and in woodwork, or formed by a groove or channel, as in modern masonry, to prevent water from running under the base of the corona. THROATING. 1.

BEAK IRON, BICKERN, or PIKE. A strong conical piece of steel projecting from one end of an anvil, the base being attached to the ANVIL, with the axis horizontal; its use being for the execution of curved work. 13.

BEAK JOINT or BEAKING JOINT. The joint formed by the junction in one continued line of several heading joints, which sometimes occurs in a folding floor. 23.

A **V joint**, also called a beak joint, was sometimes used in straight joint flooring instead of a ploughed and tongued heading joint. A. A.

BEAM. A piece of stone, or timber, or timber and metal combined, or metal only, used in a horizontal position to resist a weight, and designed to receive a cross strain. It may consist of several pieces, if the manner of their combination does not resemble that of an arch, and therefore the term is properly applied to a lintel made of brickwork in cement with or without hoop iron. It has received various names, according to its make and uses, as BINDING BEAM, BOX BEAM, BRICK BEAM, BUILT BEAM, CAMBER BEAM, CELLULAR TOPPED BEAM, COLLAR BEAM, CYLINDRIC BEAM, DRAGON BEAM, GROOVED BEAM, HAMMER BEAM, GIRDING BEAM, LINTEL BEAM, OPEN BEAM, PLATE BEAM, STRAINING BEAM, STRUTTING BEAM, SUMMER BEAM, TIE BEAM, TRELLIS BEAM, TRUSSED BEAM, TUBULAR BEAM; but some of these terms are now used either with some other adjunct than the word beam, or without any at all, as in the cases of GIRDER and BRESTSUMMER of wood and metal, and LINTEL of masonry. BOW AND STRING, RIB, SCARFING.

Although it is not proper to call an arch a beam, custom has applied the term "stone beam" to very flat arches in the cases of those at the church of the Jesuits at Nîmes, and at Lincoln cathedral, instanced by Mr. George Rennie at the Institution of Civil Engineers, 5th March 1844. The intrados of the first is the segment of a circle of 565 (?) feet diameter, and of the latter, being 30 feet between the real abutments, to one of 164 feet diameter. This last is given with full details in the *Transactions of the Royal Institute of British Architects*, 4to., Lond., 1842, p. 180.

The *Transactions of the Society of Arts*, etc., for 1824, contain Mr. Richman's mode of raising and stiffening a sagged beam; and Mr. Ainger's system of supporting and preserving partially decayed and sunken beams, etc.; and of raising and stiffening a sagged beam. The *SURVEYOR*, etc., *Journal*, 1843, iv, 187, contains the late Mr. Papworth's mode of drawing together and raising a sagged tiebeam and sunken partitions. The *ARCHITECTURAL MAGAZINE*, 1835, ii, 165, gives Messrs. Mallet's system of securing decayed and sunken flooring and partitions. STRAIN. STRENGTH OF MATERIALS.

BEAM COMPASS. A mathematical instrument which derives its name from having the measuring points attached to a

stiff bar, and not, as in common dividers, to a hinged bar. There are two sorts of beam compasses. One has an end made into a box for the reception of a point, pencil, or pen, and has a travelling box carrying a point, both boxes being fitted with clamp screws. The other kind is used where much work is being done to a fixed scale; the beam is inlaid with the necessary scales, and the boxes, if both travel, are perforated and furnished with verniers; or the head, which then carries the point only, is provided with an adjusting screw, to permit the length of the beam between the points to be slightly altered without moving the beam. W. H.

BEAM FILLING. The masonry, brickwork, or tiling, carried up in continuation of the wall, to prevent rain drifting in through the spaces between timbers, especially rafters, from the top of the outside of the wall plate to the under side of the boarding, lathing, or other preparation for the covering of a roof. 1.

BEARER. A short piece of timber, stone, or metal placed horizontally to carry a weight. Thus joists at intervals of about twelve inches from centre to centre, for the purpose of carrying the boarding of a gutter, are called gutter bearers.

BEARING. The length of that portion of a piece of timber lying on a support; it is also the distance between two such supports. A partition resting upon walls has so far a *solid bearing*; the distance in the clear between the points of support is its *bearing* simply, which is called a *false bearing* when there is an intention to imply that the laws of construction would have required a greater length of solid bearing.

BEARING WALL or PARTITION. A wall or partition built from a solid footing, for the purpose of carrying another wall or partition in the same or in a transverse direction. 1.

BEARING OUT. This expression, generally applicable to new work, is used by painters to imply that a third, fourth, or fifth coat of paint has been so fully and evenly laid upon the previous ones, that the original colour of the body, the knotting, the priming, and the under coats cover well, and give no sign of disfiguring the glossy surface of the finishing coat.

BEARSBREECH, or BRANK URSINE. The common but disused English names for the *ACANTHUS mollis*.

BEAT (SAINT) MARBLE. A white statuary marble, comparatively new in the market, procured in large blocks of good quality from the place of the same name, in the mountains of Rapp on the Garonne, in the department of the Hautes Pyrénées. It has large grains like some kinds of Parian marble; and the first quality, technically called "mild white", may be easily worked in any way. The second quality is also used by French sculptors.

BEATER (Fr. *batte*). An implement used by bricklayers and plasterers for tempering and incorporating the lime, sand, clay, and other ingredients of mortar, plaster, or cement. In former times the plasterer's beater was a long piece of wood cut like a wooden knife or slice, having a broad back and thinning towards an edge. The beating board was either three or four boards joined together, or some old door or such like, laid upon stones or timber beating height, upon which the mortar was buffed with the aforesaid beater.

The plumber uses a beater usually called a 'DRESSER', but bricklayers generally beat or buff up their mortar with a 'SHOVEL', while plasterers use a 'SERVER'. A. A.

The name is also applied to an instrument being a piece of wood 18 inches long, 6 inches thick, and 8 or 9 inches broad, having a handle fixed obliquely in the middle, and used to compress loose soil, turf, or gravel on slopes and walks. 13.

BEATON or BETHUNE (ROBERT DE), prior of Llanton, was made bishop of Hereford in 1131. He superintended the erection of a religious house at Weobly, and died at Rheims in 1149, but was buried at Hereford. BRITON, *Hereford*, 4to., London, 1831.

BEAUCHAMP (RICHARD), son of Sir Walter Beauchamp,

and grandson of John, Lord Beauchamp of Powick, was created dean of Windsor in 1477, bishop of Hereford 1449, of Salisbury 1450, and Chancellor of the Order of the Garter. He built the great hall, parlour, and chamber of the palace at Salisbury, and was appointed by king Edward IV, in 1474, "master and supervisor" of the works in the erection of S. George's collegiate chapel at Windsor Castle, where there is a monument to his memory. *LYSONS, Magna Brit.*, Berkshire, i, 702. Sir Reginald Bray succeeded him in this appointment in 1481, in which year Beauchamp died, and was buried at Salisbury, in the chantry chapel built by him on the south side of the Lady chapel, but now removed. *LELAND, Itin.*, 8vo., Oxon, 1710, ii, p. 65.

BEAUDEAN MARBLE. A magnificent Jura limestone or breccia, composed of close, yellow, brown, and red fragments, comparatively new in the market, and procured from quarries near a village in the val de Campan, not far from Bagnères de Bigorre, in the department of the Hautes Pyrénées in France. *DE CLAIRAC* thinks it the same as *CAROLINE BRECCIA*.

BEAUME (SAINT) MARBLE, see *BAUME MARBLE*.

BEAUMONT (CLAUDE ETIENNE), born in 1757 at Besançon, passed at an early age through the classes of Dumont, then professor of architecture in the Academy at Paris, and entered the office of the younger Couture, by whom he was dismissed for interference; with Montaignon he published, under the name of Dulin, *Lettre à un ami sur un Monument Public*, 4to., now very rare, being a criticism upon his master's alteration of the plan, by Contant d'Ivry, of the church of *la Madeleine*, then recently commenced.

When France was divided into departments, he was appointed architect to the *bureau des domaines* of Paris; and Chaptal entrusted to him the erection of the hall of session of the Tribunal, with the works at the *palais de Justice*, *Temple, sœurs de Charité*, and the institution for the deaf and dumb. The plan of the *théâtre des Variétés* is also said to be due to this architect. The *salle du Tribunal* gained much applause for Beaumont; but in 1820 statements were publicly made which attributed the whole merit of the construction and decoration of this work to M. Huyot. Beaumont lost several of the appointments which he had long held under the *Ministre de l'Intérieur*, the *Conseil des Bâtimens Civils*, and the *Préfet du Département de la Seine*, before his decease, in the year 1811 or 1815. His death was attributed to vexation, especially at his want of success, under very peculiar circumstances, in the competition of designs for the conversion of the Madeleine into the *temple de la Gloire*, which are detailed in the Supplement to the *BIOGRAPHIE UNIVERSELLE*.

BEAUSIRE (JEAN), admitted a member of the Academy of Architecture at Paris in 1716, died in 1743. His eldest son *JEAN BAPTISTE AUGUSTIN BEAUSIRE*, who was admitted in 1732 and died in 1764, appears to have been one of the artists who produced in competition plans for the formation of the *Place de Louis XV* and *Place de la Concorde* at Paris, 1748-1753. He had submitted previously a design for the improvement of the *Quartier de la Grèce*; and had been appointed architect to the king and to the city of Paris. Their grandson and son, *JEAN BAPTISTE ANTOINE BEAUSIRE*, was admitted in 1740, and died in 1762.

BEAUTY. That quality or combination of qualities in an object, from which we receive pleasurable sensations, in the higher interpretation of the phrase, as including both intellectual and sensuous gratification.

Beauty may be either *material*, and exist in form, colour, sound, or otherwise, affecting the senses only; or *ideal*, and consist of the association of each of these elements with others which are appreciable only by the intellect, thus appealing to the higher faculty, as in the case of Fine Art. It may be a *simple* idea, as a single outline, colour, or sound; or it may be a *complex*, and result from an harmonious combination of various attributes and manifold qualities; in either case, the pleasurable

sensations produced are caused by the gentle excitement of the organs and senses, which result from its contemplation, produced without effort, and continued without strain. Beauty has been defined as that upon which the mind rests when the eye, the intellect, and the affections are satisfied by the absence of any want. But this defines a species of imperfect beauty, which may be called negative, and which suffers the mind to relapse into lethargy from the absence of any exciting cause; true and positive beauty being as active a quality as the sublime, the terrible, or the pathetic; as irresistible in its influence, although less violently exciting. It creates a train of evenly balanced sensations, more grateful to the organs than absolute repose, and more absorbing than intense exertion; bringing each perceptive faculty into harmonious action, it elevates and refines, enchains and absorbs the feelings in exact proportion as the quality of beauty in the object is *material* or *ideal*, and as the intellect to which it is addressed is so finely organized as to be sensible of these delicate impressions.

Beauty in Architecture, as in every art, is simply that particular phase of this quality or qualities, which results from the vehicle through which it is expressed; the idea itself being, so to say, a constant. In everything beauty results from perfect harmony and faultless regularity happily united with variety discernible only by the absence of monotony; from strict unity and propriety; from proportion regulated with the nicest discrimination; and from expression forcibly, but not harshly, pronounced: from an assemblage indeed of qualities, each beautiful in itself; each necessary to the beauty of the whole; yet each subdued within its proper limits, challenging examination, yet not enforcing attention: perfect beauty, in Art as in Nature, is the happy combination of all the elements of beauty, the preponderance of none.

WREN, as quoted in *Parentalia*, fol., London, 1750, p. 351, points out very justly that warping of the judgment which results from fashion or education: he observes that beauty is "a harmony of objects, begetting pleasure by the eyes. There are two causes of beauty, natural and customary. Natural beauty is from geometry, consisting in uniformity (that is, equality) and proportion. Customary beauty is begotten by the use of our senses to those objects which are usually pleasing to us for other causes, as familiarity or particular inclination breeds a love to things not in themselves lovely. Here lies the great occasion of errors; here is tried the architect's judgment: but always the true test is natural or geometrical beauty. Variety of uniformities makes complete beauty." H. B. G.

To the above definition by *WREN*, there has been added the principle of fitness; or that scientific, statical, and constructive proportion or adaptation, which is seen in the works of Nature. *HOGARTH, Analysis of Beauty*, 4to., London, 1753, makes fitness, variety, uniformity, simplicity, intricacy, and quantity, the principles of beauty.

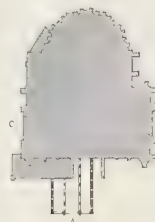
In addition to the works mentioned under *ÆSTHETICS*, *COLOUR*, *DESIGN*, *GEOMETRIC PRINCIPLES*, *HARMONY*, *SYMMETRY*, *PROPORTION*, *TASTE*, etc., the following, relating chiefly to architecture, may be referred to: *BRISSEUX, Traité du Beau*, etc., fol., Paris, 1752; *BURKE, Philosophical Enquiry*, 8vo., London, 1757, and later editions; *GUILLAUMOT, Essai sur les moyens de déterminer ce qui constitue la Beauté essentielle dans l'Architecture*, 8vo., Paris, 1802; *GWYN, Essay on Harmony*, etc., 8vo., London, 1739; *LEGH, Music of the Eye*, etc., 8vo., London, 1831; *HAY, First Principles of Symmetric Beauty*, 8vo., Edinburgh, 1846, and other works; *GRIFFITHS, Ancient Gothic Churches, their Proportions*, etc., 4to., London, 1847; *HARDING, Elementary Art*, 4to., London, 1836; *Principles of Art*, etc., 4to., 1845; *Lessons on Art*, 4to., 1849; *Guide and Companion*, 4to., 1850; *ALISON, Essays on the Nature, etc., of Taste*, 8vo., London, 1811; *JEFFREY, s. v. in Encycl. Brit.*, 1841, reprinted in *Contributions*, etc., 8vo., London, 1853.

BEAUVAIS (the ancient *CÆSAROMAGUS* and *BELLOVACUM*). A city in the department of the Oise in France. The very old

central portion of the town is called *la cité*, and chiefly consists of irregular and narrow streets, which however are well paved and well cleansed. The houses, especially those within the remains of the old walls, are chiefly of wooden construction plastered; but they afford picturesque views, on account of the number of gables set towards the street, and of the quantity of sculpture and ornamentation which occurs at every point. The cathedral, dedicated to S. Pierre, would have been the largest church in Christendom, had it been completed; but, although intended to rival that at Amiens, commenced five years previously, it only consists of the wreck of the loftiest Gothic choir and transepts in the world, being a remarkable instance of a cathedral without a nave. The total height from the pavement to the under side of the ridge of the vaulting averages 148 feet. The extreme length of the building within the walls is about 238 ft.; the length of the transepts is 189 ft., as given by WINKLES, who also adds the following dimensions: the width 41 ft. 10 ins.; the breadth of the choir 44 ft. 7 ins. between the piers, while the inner aisles are only 15 ft. 2 ins.; the outer aisles, 16 ft. 4 ins. wide, are not continued round the apse, but the space is occupied by seven radiating chapels answering to so many bays of which the apse and its aisle consist. The choir, or rather its apse, was commenced by bishop Miles de Chastillon (1217-1234) in 1225, and the works were steadily continued under bishop Guillaume de Gretz (1249-1267), to whose period the greater portion of the ground floor of the choir and its aisles belongs. But the piers of this part of the building being placed too far apart, the vaulting is said to have fallen, although iron ties had been used as a measure of precaution, and to have been reconstructed before 1272, in which year the choir was first used for Divine Service. The vaulting certainly fell 29 Nov. 1284, and to prevent the recurrence of the accident, piers were inserted in the spaces which intervened between the original ones: forty years were consumed in the execution of these repairs and alterations, and the present triforium and clerestory belong to that period: the church was again used for Divine Service in 1324. In 1338 bishop Jean de Marigny commissioned Enguerrand le Riche to complete the cathedral, but it is uncertain what works were undertaken: at all events the national calamities which occurred caused a suspension of the works until the beginning of the sixteenth century.

The first stone of the north transepts was laid 31 October 1500 by bishop Louis de Villers l'Isle-Adam (1487-1521). The architects from his time are recorded as follows; Martin Chambiges of Cambrai, and Jean Wast or Vaast of Beauvais, whose names are appended to a report dated 2 July 1512; Jean Vaast the younger, on the death of his father, 1524; Scipion Bernard, 11 December 1528, was associated with him as assistant to Chambiges, whose death, 29 August 1532, made room for Michel Lalye, who with the younger Vaast and François Maréchale, *archicharpentier*, built the walls of the transept. These walls were completed in 1555, or rather earlier; the first date marked on the vaulting of the transepts is 1550; the next, 1570, is found on the vaulting at the choir; WOILLEZ states that the transepts were partly finished in 1555, that the date 1577 is found on its southern vaulting, and that of 1578 near the ridge of its northern vaulting. The two bays of the neighbouring vaulting of the choir are dated 1575; these bays were destroyed by the fall (30 April 1573) of the tower, which had been commenced in 1560, and finished at a height of 479 feet from the ground, in 1568. The design of this tower is known from drawings lately or still in the possession of M. Dorgedray of S. Lucien near Beauvais, and engraved by GILBERT, *Notice historique et descriptive de l'église*, etc., 8vo., Beauvais, 1830. One compartment of the nave was completed when the tower fell; the repairs of the choir and transept being finished, the two next bays of the nave were erected (the foundations having been laid a long time previously), but want of funds caused the chapter to finish the whole frontage with a plain stone wall; the entrances are consequently at each

end of the transepts at b and c. The works were definitively suspended in 1604. These façades have both fine rose windows, but differ very much in appearance, although both are of the *flamboyant* style, as the northern one, containing the *porte de S. Paul*, c, bears a peculiar and uncommon resemblance to English Third Pointed work; it was commenced in 1530 and finished in 1537. The front of the southern transept is flanked with turrets instead of angle buttresses; it contains the *portail de S. Pierre*, b, the work of Michel Lalye, and was finished in 1548. The stained glass, of the first half of the



sixteenth century, has suffered from time and violence, but it still forms a principal feature among the attractions of the cathedral. The vaulting of the choir again fell in 1802, and a wooden imitation occupies its place. The *basse œuvre*, a, at the west end of the cathedral, and occupying part of the site of the intended nave, is as remarkable a specimen as any other church of the architecture of the eighth or ninth century: the

masonry has bands of tiles and tiled arches, *more Romano*.

The church of S. Etienne, built at the beginning of the eleventh century and belonging to the period of transition to the style *Ogival primaire*, has some excellent stained glass of the sixteenth century, and the front of the southern transept is remarkable for the richness of its decoration. The church of S. Lucien is interesting from having the tower built by Odo and the nave by Wimbold in 1078, according to a document cited by FELIBIEN, who calls them *cementarii*. The episcopal palace was rebuilt in the fifteenth century, and resembled a fortress, being surrounded with walls, and entered only by a gateway between two large round towers with high roofs: it has been dismantled, and part is occupied as the *hôtel de la préfecture*. The *hôtel de ville* has an Ionic façade, and is the finest modern building in the city; few new public buildings have been required since the appropriation of about twenty monasteries and convents with their churches to secular purposes; besides which there are two hospitals, a college, a court-house, cavalry barracks, and a handsome theatre. 14. 28.

LOUVET, *Nomenclatura et Chronologia Rerum Eccles. Diocesis Bell.*, 8vo., Paris, 1618; WOILLEZ, *Description de la Cathédrale de Beauvais*, fol., Paris, 1838, and *Archéologie des Monuments Religieux de l'ancien Beauvaisis depuis le cinquième siècle jusque vers la fin du douzième*, fol., Paris, 1842; INKERSLEY, *Inquiry*, etc., 8vo., London, 1850; P'ANSON, paper read at the ROYAL INSTITUTE OF BRITISH ARCHITECTS, 16 June 1851; WHEWELL, *Architectural Notes*, 8vo., Camb., 1842. WINKLES, *French Cathedrals*, 8vo., London, 1837, gives a good plan and several views; and may be compared with NODIER and TAYLOR, *Voy. Pitt.*, fol., 1848 (Picardy), who devote in vol. iii, thirty-four plates to the illustration of the cathedral, the *basse œuvre*, the churches of S. Etienne and S. Thomas; and twenty-one other plates, etc., to such remarkable buildings in the vicinity, as the curious church and chapel of S. Germer; abbey of S. Paul aux Bois; house of Henry IV at Gerberry, etc.; TREMBLAY, *Notice sur la ville et les cantons de Beauvais*, 8vo., Beauvais, 1815.

BEAZLEY (CHARLES) was a pupil of Sir Robert Taylor. Among his numerous works are a castle in Invernesshire; a mansion at Frant near Tunbridge Wells, for Charles Edward Pigou, Esq.; a villa at Ospringe Place, Faversham, Kent, for Isaac Rutten, Esq., 1799; and the tower and spire of Faversham church, 1799, a successful imitation of that of S. Dunstan's in the East, London; a mansion at Shernfold, Sussex, for C. E. Pigou, Esq.; Hereford, in Sussex, for Mr. Pigou; Hollingbourne Place, Kent, for B. D. Duppa, Esq., all three from 1799 to 1801; a triumphal arch at Maidstone, 1800; extensive alterations at Toddington, Gloucestershire, the seat of Charles Hanbury Tracy, Esq., now Lord Sudeley, probably to the old house, as the merit of the present one, commenced

in 1819, is given to Lord Sudeley by BRITTON, *Illustr. etc., of Toddington*, fol., London, 1840; several buildings in London and its vicinity, and with George Smith he designed the chapel, now rebuilt, in Jewin Street for Dr. Rees. As architect to the Goldsmiths' Company he made drawings in 1804 for a new Hall, which were not executed; and designed their new almshouses at Acton in Middlesex. He was for nearly fifty years district surveyor for the parishes of S. James and S. John, Clerkenwell. His pupils were George Maliphant, George New, William Rogers, and the late William F. Pocock and Samuel Beazley. He died at West End, Hampstead, January 6, 1829, aged 63.

BEAZLEY (SAMUEL), a nephew of the above, was born in Parliament Street in 1786, and served in early life as a volunteer in the Peninsular war. He was also well known as an author, and during the course of his career he wrote or arranged more than one hundred dramatic pieces, two novels, and a large number of detached articles, more particular mention of which will be found in a memoir in the *BUILDER Journal*, ix, 695.

One of his earliest architectural works was rebuilding in 1816 the Royal Lyceum Theatre, London, at a cost of £80,000 (BRITTON and PUGIN, *Edif. of London*, 8vo., London, 1828, i); this having been destroyed by fire, Feb. 16, 1830, a new theatre was built under his direction during the years 1831-4, a new green room, etc., was added in 1838; the total expenditure being £21,000 without the decorations (*BUILDER Journal*, v, 489 and 507). In 1822 he remodelled with great skill the interior of Drury Lane Theatre at a cost of £21,000 (BRITTON and PUGIN, *Edif. of London*, i), and added the portico in Little Russell Street in 1831; the present decorations were carried out under Frederick Gye in 1847; *BUILDER Journal*, v, 465; and *ILLUSTRATED LONDON NEWS*, vol. xi). The Theatre Royal, New Street, Birmingham, was rebuilt under his direction, to hold upwards of 2,000, between January 6, when the former building was destroyed by fire, and August 14, 1820, when it was opened; but the façade, by Geo. Saunders, is of the date of 1780. After his designs the Theatre Royal, Hawkins Street, Dublin, was rebuilt in 1821; the façade of the Adelphi Theatre, London, in 1841; the Soho Theatre, Dean Street, about 1834; the S. James' Theatre, King Street, London, for Mr. Braham, in 1836-7; the theatre at Leicester in 1836; and the Royal City of London Theatre, Norton Folgate, in 1837. He gave designs for one to be erected in the Brazils, similar to that of the S. James's above-mentioned; and also for another in Belgium.

Amongst his numerous works of a more private nature are Studley Castle, Warwickshire, for Sir F. L. H. Goodricke, 1834; some additions to the University at Bonn; schools and park entrance, etc., for Thomas Bernard, Esq., M.P., 1810, in Ireland; a house for Mr. Arraben, at Beccles Hill, Essex; the Amicable Insurance Office in Fleet Street, 1843; the brewery at Brentford, etc. He was largely engaged on the buildings for the South Eastern Railway Company, including part of the station at London Bridge with the arcade, 1850; the Railway Station at Ashford, Kent; the Lord Warden's Hotel, 1850 (*CIVIL ENGINEER Journal*, xiv, 519), and the Pilot House, 1848, both at Dover (*BUILDER Journal*, vi, 414); with the stations on the North Kent Railway. He died 12 October 1851 at his country residence, Tonbridge Castle, Kent, aged 65 years, and is interred in the family vault in the burial ground attached to Bermondsey Old Church, London.

BECCERA or BACERRA (FRANCISCO), born about the middle of the sixteenth century at Trujillo in Estramadura, was the best architect who visited America during the palmy period of Spanish architecture. He was a grandson of the celebrated Hernan GONZALES DE LARA, into whose family he also appears to have married, and a pupil of his father Alonso, a practitioner esteemed in the province of Estramadura, wherein he executed several buildings. Having erected for Don Carlos

de Guevara several mansions, and a chapel between the two cloisters in the monastery of Guadalupe, he obtained a passport for New Spain, in 1573. Immediately on his arrival at Puebla de los Angeles, he designed the choir of the convent of S. Francisco, the chief edifice in that kingdom; the convents of S. Domingo and of S. Agustin; the college of S. Louis; and chapels at Totemeguacan and Guatinchan. In Mexico he rebuilt the church of S. Domingo, which had fallen through bad construction; he also built churches at Talnepaula, Cuitababaca, Tepuzthlan, and other places in the marquisate del Valle, which gained him such reputation that he was appointed by the viceroy, 24 January 1575, *maestro mayor* to the proposed cathedral at Puebla.

Beccerra removed to Quito, where he designed and commenced the churches of the convents of S. Domingo and S. Agustin, and three bridges; but in 1581, the viceroy of New Spain having been removed to Lima, sent for him to design and construct the cathedrals at Lima and Cuzco; this patron died soon after the arrival of Beccerra, but the *Real Audiencia*, on the 17 June 1584, conferred on him the title of *maestro mayor*. He also designed the *casa real* at Lima, and a fort at Callao. 66.

BECHERER (FRIEDRICH), a member of several Academies, was born at Spandau in 1746. Having studied under Buering, Hildebrand, Munzer, and Gontard, at Potsdam, he built several public and private edifices at Berlin and Potsdam; and became a privy councillor for civil and military buildings, as well as head of the *Bau-Komtoir* at Berlin, in which city he chiefly resided, and there died in 1823. 68.

BED. The position of the plane of deposit of any stone in the quarry is called the quarry-bed (Fr. *banc*); a stone not so laid is said in the French language to be *en délit*. In building walls of stone, the ASHLARS should be laid on the same bed as they held in the quarry; with rubble work, and with all stratified rocks, such as slate, etc., the same system should be observed; though SMITH, in *Transactions of the Royal Institute of British Architects*, part ii, 139, states that the liver rock from the Craigleith quarries is equally durable, or nearly so, in whatever position it may be fixed; and adds, p. 149, "the importance of placing stones on their natural bed is generally very considerably overrated: I do not consider it signifies which way a stone is fixed, unless it presents a decidedly laminated structure, which scarcely ever occurs amongst the oolites. A stone of an open, powdery, and slightly cemented texture, will, if exposed to the weather, decompose in a comparatively short space of time, in whatever direction it may be fixed, or whichever surface may be parallel to the horizon." W. H.

BED. The under side of a SLATE, and the upper and lower horizontal surfaces of a brick, stone, or any such building material; the former is called the upper bed, and the latter the under bed; and when the first has been covered with mortar, the cementing medium becomes the bed for the covering brick or stone. In many antique examples of masonry the beds are *dished* or hollowed out, with the intention of obtaining a fine joint, as in the frusta of columns; the same practice is followed in modern brickwork, to form a sort of key for the mortar, but many bricklayers lay the hollowed bed upprmost "to hold the mortar". JOINT; VOUSOIR. 1.

BED CHAMBER. An apartment specially contrived to contain a bed. BED ROOM.

BEDDING-STONE. A straight piece of marble from 18 to 20 inches long, about 9 inches wide, and of any thickness, laid by bricklayers upon a BANKER, and used to try whether the surface of a rubbed brick is straight and fit for use. TEMPLATE. W. H.

BEDDING TIMBER is the operation of placing it in the position it is designed to occupy definitively upon a solid bearing, or bed. The timber may be bedded either upon masonry, upon other pieces of wood, or upon metal supports; in which cases different precautions and modes of execution are requisite. 1.

Timber bedded upon masonry acts upon its supports by transmitting the vibrations to which it may itself be exposed; and for this reason the ends of joists, or girders, are supported upon wall plates, sleepers, or shoes, and sometimes on stone bearers, so as to distribute the effort over the greatest surface. When wall plates are used it is important to prevent dampness from reaching them; as on account of their being almost entirely surrounded by the walling, such dampness would rapidly cause them to decay, and to communicate the germs of decomposition to the pieces they are intended to support. The masonry (or walling) should in these cases be composed of materials that will not allow the passage either of external moisture through the body of the wall, or of ground-damp by capillary action. No timber should be placed at a less distance than 9 inches from the external face of a building of any importance, and a layer of impermeable material should be inserted between the underside of the plates and the ground. The wall plates themselves should be carefully selected from wood free from sap, shakes, or other defects, and be laid upon an even stratum of mortar made of the best hydraulic lime, or of cement. A tolerable thickness of this mortar should also be inserted between the timber and the masonry of the wall. It is desirable that the ends of joists, girders, etc., which bear on a wall should be so placed as to allow air to circulate around them, and not to be in immediate contact with the masonry. Indeed it is very important to observe that timber is exposed to decay very rapidly when surrounded by mortar or fresh masonry, because the hydrate of lime in the mortar has a great affinity for carbonic acid gas, and will absorb much of that gas previously existing in the wood. This abstraction of carbonic acid gas must hasten the decay, and it would appear from elaborate observations made on the continent, that the ancient practice of bedding timber in loam is equally dangerous. The principal danger in all such cases arises from the chemical action of the moisture contained in, or absorbed by, the wood itself, which superinduces fermentation when air cannot circulate freely round the portions enclosed in the wall. The use of hydraulic mortar, recommended above for bedding wall plates, is merely to prevent as much as possible the transmission of extraneous moisture; theoretically it would always be preferable that timber should be isolated. In the best modern buildings, therefore, it is the custom to support the ends of beams, joists, etc., upon stone or metal corbels; the wood being entirely isolated, and the only precaution to be observed in bedding it upon the supports being to ensure the equal distribution of the weight on the bearing surface, and the resistance of each part to the mechanical efforts it may have to support. If the internal decoration should not allow the introduction of corbels, the ends of beams, etc., built into walls, should be kept clear of the masonry by carrying hand arches over them, and leaving a small space at the sides and ends.

Colonel Emy mentions a simple and apparently very successful method of protecting the bearings of timber formerly practised near Bayonne, which might perhaps be occasionally employed at the present day. In demolishing a part of the old castle of La Roque d'Ondres, the girders were found to be perfectly sound, after a lapse of at least six hundred years; and when the old church of the Benedictines at Bayonne was pulled down, the girders were found to be rotten and worm-eaten everywhere but at the bearings. In both cases the timber had been coated, for the whole length of the bearings, with cork, resting upon a bed of loam; the protection afforded by the cork, which is impermeable, must have been the most valuable condition of this mode of construction. Coating the bearings with lead, zinc, or iron, might answer the same purpose, if the wood were thoroughly seasoned; if, however, it contained any sap, fermentation would soon take place. The practice of coating the ends of timber with tar or pitch appears to be susceptible of the same observations: it is of use only when the wood is thoroughly dry before the coating is applied; when

the wood is damp the coating is prejudicial precisely to the extent of its impermeability. Felt might be substituted advantageously for the cork alluded to above.

In some parts of the country it appears that the opinion is frequently entertained that moisture may be absorbed by wood placed in a building, and transmitted to the bearings by means of the pores. This opinion may be founded on the phenomena observable when very green wood is employed, for in those cases the circulation of the sap in the capillary vessels not having ceased, it would naturally exude at the ends. Moisture may also be transmitted to the bearings by adhesion to the surfaces; but when properly seasoned timber is employed, the danger from either of these actions must be so insignificant as not to merit attention.

When timber is bedded upon iron, sheet lead is often placed under it; because the ductility of the lead ensures a more perfect bearing, and because atmospheric moisture does not condense so readily upon lead as it does upon iron. When great durability is requisite, it is desirable to insert wedges between the wood and the lead, so as to allow a free circulation of air beneath the former.

In foundation works it may sometimes be necessary to resort to the use of timber platforms, for the purpose of distributing the weight of a building over the largest available surface. The precautions to be observed in bedding timber, in such cases, are principally those which may ensure the most uniform bearing, and guarantee it against alternations of dryness and humidity. It is essential that the surface of the excavation should be dressed off to a uniform level; and that the various pieces of the framework should be of similar scantling, and so put together as not to slide over one another. Usually the intervals between the courses of timber are filled in with hydraulic concrete, or masonry of a similar nature, in order to ensure level bearing for the courses immediately above them. It must be observed, however, that all which can be secured by the greatest care in bedding platforms of this description resolves itself into a purely mechanical effect; the durability of the wood will still depend, firstly upon its qualities, and secondly on its conditions of exposure. TREDGOLD, *Elementary Principles of Carpentry*, edited by BARLOW, 4to., Lond., 1840; EMY, *Traité de l'Art de la Charpenterie*, fol., Paris, 1837; RONDELET, *Traité etc., de l'Art de Bâtir*, and Supplement by BLOUET, 10th edit., 4to., Paris, 1852.

G. R. B.

BEDEL (PIERRE), a Frenchman, commenced in 1555 the great work of the *mina* or conduit at Daroca in Spain, which was not finished until 1562, he having in the meanwhile commenced (1552) and finished (1564) the famous aqueduct called the *Arco de Teruel*. Soon afterwards he was invited to superintend the restoration of the cathedral and Dominican church at Albarracin; in which city he died 30 May 1567. The three-ailed Gothic parish church at Fuentes de Ebro with its crypt, serving as the mausoleum of the counts of Fuentes, is attributed to him.

BED MOLD or BED MOLDINGS. The term applied to the moldings placed as a bed beneath the corona of a cornice, or other wide soffits in general.

BED ROOM. A chamber appropriated to the reception of one or more beds. "In the construction of a house, the dimensions of the bed rooms, and the means of ventilating them, ought to be the most important considerations, whereas they are comparatively little thought of. Nothing, indeed, can be constructed on a worse principle than the bed rooms in this country generally are. Their small size and their lowness render them very insalubrious, and the case is rendered worse by close windows and thick curtains and hangings, with which the beds are often so carefully surrounded as to prevent the possibility of the air being renewed. The consequence is that we are breathing vitiated air during the greater part of the night; that is, during more than a third part of our lives; and thus the period of repose, which is necessary for the renovation of

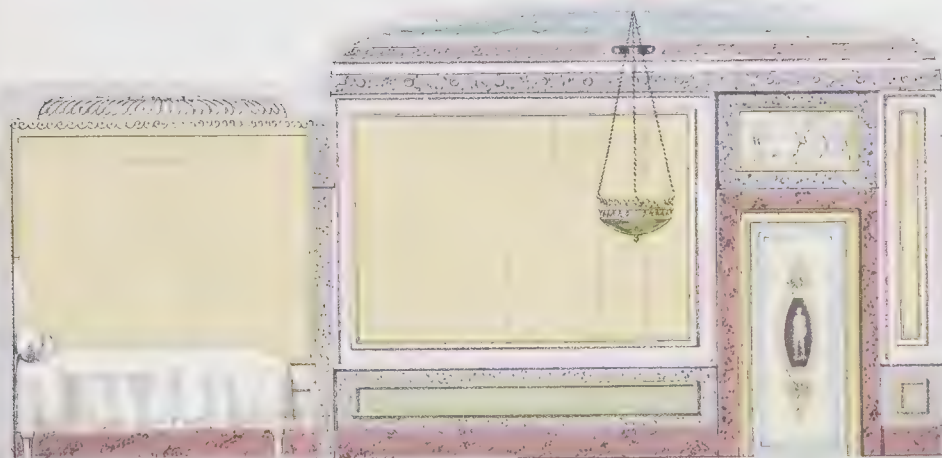
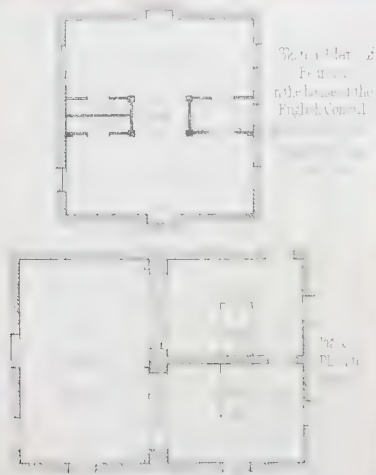


Fig. 3. Longitudinal



D. Mueller KLA



Walter Smucke M.D. A.B.:





our mental and bodily vigour, becomes a source of disease." CLARK, *Sanative Influence*, etc., 8vo., London, 1841, p. 100.

BEDUZZI (ANTONIO) of Bologna, flourished as an architect at Vienna in 1720. 26.

BEECH. The English name for FAGUS; see also FRAXINUS, the ash.

BEEF-WOOD, BEEF-OAK, BOTANY BAY OAK, SHE-OAK, and BULLY TREE, are various names applied to a red coloured ornamental wood of Australia; see CASUARINA and ROBINIA.

BEEHOUSE, see APIARY.

BEEJAPORE (or VIZIAPUR, corrupted from VIJAYAPURA). The capital of the district called by the same name in Hindostan. The city is situated in a fertile plain near the right bank of a tributary to the river Crishna, and seems to have consisted of three towns, one within another. The exterior town is said to have been surrounded by a wall of many miles in extent, but jungle and ruins now occupy a great portion of the space so enclosed, which reached above five miles westward from the present boundary of the city properly so called, or outer fort, as it is sometimes termed. This boundary, which forms the first striking feature of Beejapore, consists of a high wall with towers; seven gates, of which one or two are closed; and a broad ditch, extending $6\frac{1}{2}$ miles: one street, nearly 3 miles long and 50 feet wide, paved throughout, extends across the city, and presents many public and private stone edifices worthy of notice. The citadel or inner fort, about $1\frac{1}{2}$ mile in circumference, stands nearly in the centre of the city; it has had a deep ditch, 300 feet wide in many places, and includes some *mahals* or palaces, one of them being seven stories in height, two mosques, and a pagoda, which have been splendid buildings. One of the palaces is built of a black stone or marble. The inhabitants allege the existence formerly of 800 mosques of stone and as many of brick, with 984,456 houses; and the number of buildings within and without the walls, and the amazing extent of ground which they cover, render this account almost worthy of belief: while the richness and scale of the chief remains justify the title of "the Palmyra of the Deccan". These edifices were raised in about two centuries, and are comparatively modern as the independent dynasty of Beejapore commenced in 1500 under Yusef Adil Shah, a son of Amurath II, of Anatolia. His successors were Ismail Adil Shah, 1507; Ibrahim Adil Shah, 1534; Ali Adil Shah, 1557; Ibrahim Adil Shah II, 1579; Muhammed Shah, 1626; Ali Adil Shah II, 1660; and Scunder Adil Shah, in 1672, who was subdued by Alungir (Aurangzebe) and taken prisoner in 1685.

The most remarkable building is the tomb of Mahomed Shah, called the Gol Goomuz, which stands in the north-east part of the city, and has a dome visible at a distance of fourteen miles. This edifice, which is said to have occupied forty-two years in building, is a square brick edifice with octagonal towers and minarets at the angles, divided into eight stories of one room each, with staircases up to the dome. At the height of 83 feet a cornice between the towers projects to the extent of 12 feet; above it is an open gallery, and still higher is an ornamental band of fret work, surmounted by a handsome battlement relieved by eight smaller minarets, two on each face of an apartment, 135 feet square internally, and contracted, at the height of 57 feet from the floor, by an elegant arrangement of pendentives, to a circular opening of 97 feet; on the platform over the pendentives is erected a dome, apparently semi-elliptical in section, 124 feet in diameter, with an internal gallery more than 12 feet wide; this dome transmits sound in the same manner as that of St. Paul's, London, and some others. The internal height of the dome is 175 feet; the exterior height to the apex is 198 feet; the general thickness is about 10 feet, although at the apex it is nearly 18 feet: there is a credible tradition, that it was built without any centering. The whole edifice has a heavy appearance. Close to it, but separated from the tomb or mausoleum, is "a handsome mosque; and at the distance of

300 feet, on the south face, there is a vast *nigara khana*, built upon a large arch, which was intended for a gateway."

The other chief building, the Ibrahim Rozah, or tomb of Ibrahim II, which is "a light and highly finished structure, with a mosque adjoining, the whole surrounded with a strong wall, through which is a handsome gateway", is said to have occupied 6,533 workmen during thirty-six years eleven months and eleven days, and to have cost £700,000; but Colonel SYKES allows only twelve years. It is much smaller than the one above described, being only 116 feet square over all, and 114 feet high to the top of the crescent. In plan it consists of an internal apartment, 40 feet square and 35 feet high, covered by a stone ceiling, which is flat in the centre, and coved at the sides: over this is a room with pendentives similar to those of the tomb of Muhammed, and upon them is raised the dome. The tomb is surrounded by a double verandah, flat-roofed throughout, and supported on square pillars with bold capitals. The buildings are of stone, and the decorations in relief equal anything in India for infinite variety and elegance of design, and for the ability of execution. The exterior walls of the tomb, and the ceiling of the open verandah which surrounds it, are wholly covered with sentences from the Koran, mingled with wreaths of flowers enclosed in compartments, the border of each compartment differing in pattern from that adjoining. The window openings are filled with Arabic sentences cut out of stone tables, instead of lattice or fret work, the space between each letter perforating the stone and admitting the light.

The Jumma Musjeed, or great mosque, consists of one great apartment, divided by five aisles in one direction and nine in the other into forty-five squares, nine of which are covered by the great central dome, 75 feet in diameter; the remaining thirty-six having each a small flat domical ceiling of great beauty. This building is 258 feet long by 144 feet wide; in front two wings project 188 feet, and enclose with the mosque three sides of a court-yard. It no doubt was intended to enclose the fourth also by a wall and a gateway worthy of the mosque and of its own position in front of the building. Though commenced by one of the earlier kings of the dynasty, the building was left unfinished when the race was overthrown by Aurungzebe. The architecture is remarkable for the elegant simplicity of the details and the beautiful proportions of the parts; and though it presents nothing so striking, for size and construction, as the tomb of Muhammed, or so rich as that of Ibrahim, the whole may fairly rank as one of the best specimens of the simple and pure style of architecture which so frequently characterizes the early mosques of the Mahomedans in India.

The palace called the Ashar Moobaruck, situated just outside the ditch of the citadel, consists of one block of building, measuring 100 feet by 135 feet. In front is a large verandah, 38 feet deep, supported by four wooden pillars; behind are various walls and apartments, two stories in height. It cannot pretend to the architectural splendour of the three buildings just described, but it is an interesting illustration of the mode in which Indian architects employed wood in their construction: a difference in spacing, in construction, and in detail, between this and the buildings of stone, is everywhere apparent. The building is now used as a relic shrine or temple, and it is singularly interesting as a means of comparison with the buildings of Persia.

The private dwelling called the Mahturee Mahal is, though small, not the least interesting or beautiful. Although only 24 feet square on the plan, and 50 feet in height, it must have cost more than the building last described. Every part of its walls, floors, and partitions is built of stone, and some parts of it are carved with an elaborateness only to be found in India.

Such are the five buildings of Beejapore, of which about seventy geometric and detail drawings, procured by the East India Company, were described by FERGUSON, *Papers* read at Royal Institute of British Architects, Nov. 27 and Dec. 11, 1854; but there are no illustrations of the mosques, tombs, and

palaces which crowd every part of the citadel, of the inner city, and of its suburban town, many of which are as rich and ornate; and although perhaps on a smaller scale, still in the aggregate as worthy of illustration: "the remains of a work commenced by Ali Adil Shah, consisting of many parallel rows of arches, intended for a building to have thrown its shade upon the tomb of Muhammed, distant half a mile", are only known by report. There are many fine wells, and the Taj Bowree is "a superb tank, about 300 feet square and 50 feet deep, surrounded by a colonnade and gallery; the entrance to it is through a grand arch, on either side of which is a wing for the accommodation of travellers; the descent to the water is by a considerable flight of steps." Not far from this is the military *khajas* or treasury, also called the Mailree Kujos, "a small but elegant mosque about the centre of the city": this building was erected under Ibrahim I, and is remarkable on account of the massy stone chains pendent from the angles of the building, as they must have been cut out of the solid stone, there being no junctions visible in the links. "The caravan-serais, which generally consist of long lines of lateral arches placed in the manner in which the arches of a bridge are, built up at one end but open at the other to the street, are too numerous for particular mention." SYKES, (*Transactions of the Literary Society of Bombay*, 4to., London, iii, 55, from whom the passages quoted are taken), also observes that very little wood or brickwork and no marble have been used; and that the buildings placed on arcades or chiefly composed of arches are commonly in excellent repair, whereas more massy works, not arched, have sunk under the ravages of time.

BEER (IIANS) built at Nuremburg the Augustine monastery, between the years 1485 and 1488. 68. 92.

BEETLE or BOYTEL. A large maul or mallet with a handle about three feet in length, used to strike the rough timbers in a piece of framing until they are driven in the desired position. 23.

A large mallet used for cleaving wood and driving piles. Large beetles have two handles inserted in them, about thirty degrees apart, so as to admit of their being lifted by two men. 2.

A large wooden rammer with one, two, or three handles, for as many persons; with it piles, stakes, wedges, paving stones, etc., are driven.

BEE'Y. A black wood of Canara in the East Indies, used for furniture. 71.

BEFFROI, see BELFROY.

BEIMBOO. A large tree of the woods of Paulghaut jungle, East Indies, of a yellow colour, used for building and for furniture. 71.

BEINTEAK. An inferior wood of the Paulghaut jungle, East Indies, of a light colour, used for building and for common work. 71.

BEJA (the Roman PAX JULIA or PAX AUGUSTA). The capital of the district of the same name in the province of Alemtejo in Portugal. The town, situated on a rock of granite rising out of a fertile plain, is almost circular, and is surrounded by walls with forty towers, of Arabian (717-1165) and Portuguese construction. Except the modern streets, which are regular and contain good houses, the chief part of the present city is said to have been built by Alonso III, of Portugal, and the castle, reputed one of the finest in the kingdom, dates from the reign of his son Denis (1279-1325). Besides some remains of Roman works; the cathedral, dedicated to S. Salvador; four parish churches; six convents; the town hall; and the *casa de misericórdia*, are worthy of notice. 50. 75.

BELANGER or BELLANGER (FRANÇOIS JOSEPH), born at Paris in 1744, obtained from the Academy one of its medals for his competition design of a triumphal column, and was thereon much employed to arrange funeral ceremonies, public entertainments, and court festivals. He also distinguished himself by his designs for houses and gardens (being one of the first to introduce into France, about the year 1780, the style of garden-

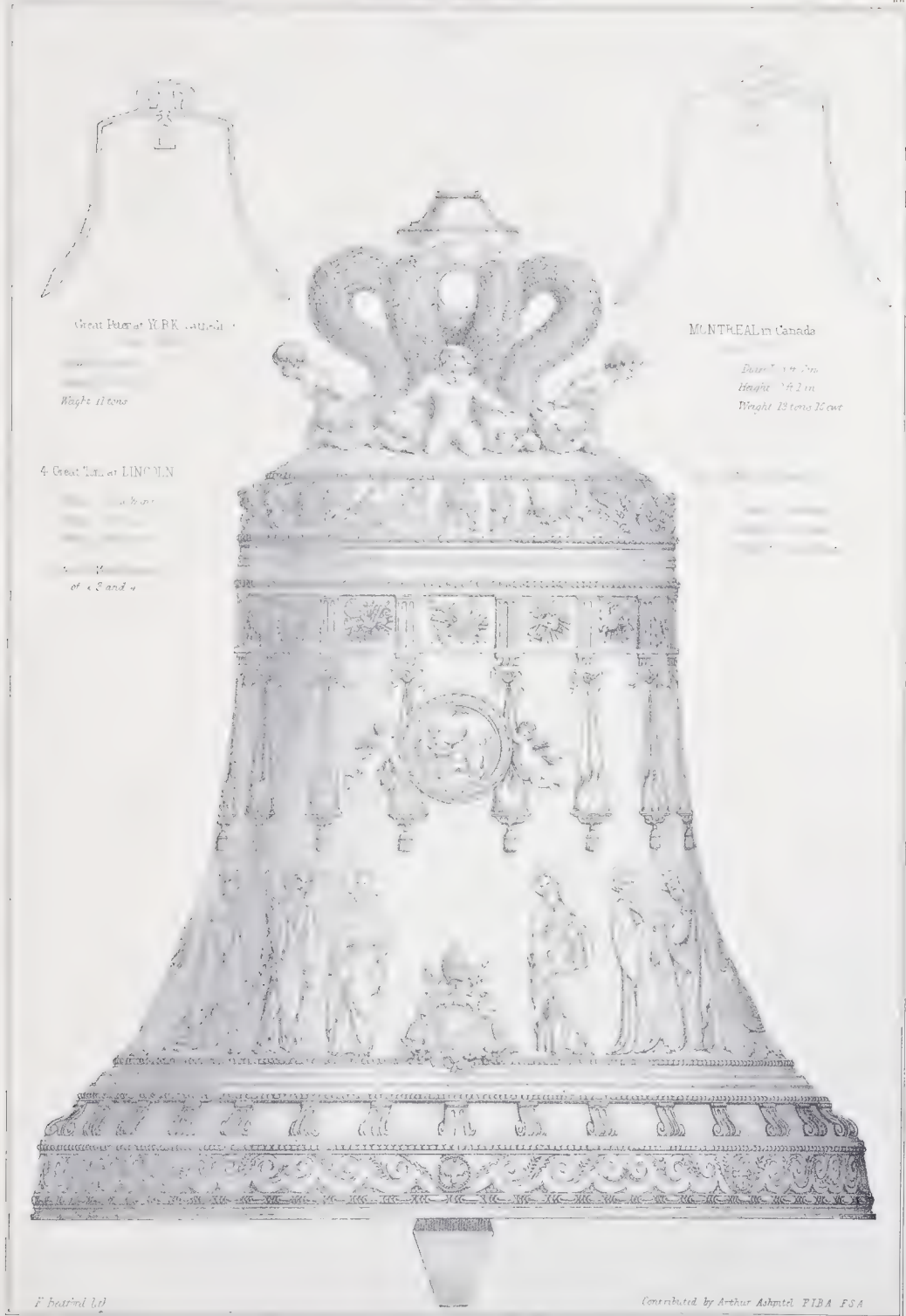
ing then called on the continent *à l'anglaise*), among which was Bagatelle in the *Bois de Boulogne*, belonging to the Count d'Artois, to whom Belanger was appointed chief architect. LEGRAND and LONDON, *Description de Paris*, 8vo., Paris, 1809, iv, 2 and 39, give the plans and elevations of three houses built in 1788 for himself in the *rue S. Georges*, and of the *hôtel de Brunoy* in the *rue du faubourg S. Honoré*, which are worth inspection. In a memorial addressed from a prison 20 April 1795, to the United Commissioners of Finances and of Domains, he stated amongst other things, that several buildings of some note, and many valuable objects in bronze, porphyry, and granite, selected for the *Musée National*, were designed and superintended by him; and added that "les manufactures de papiers-teintures me doivent l'origine de leur établissement." On the Restoration he was rewarded with the appointment of *intendant des bâtimens* to the Count d'Artois (Charles X), and the rank of chevalier of the Legion of Honour. Besides the dwellings and English gardens which were executed from his designs, of which few remain, he built in 1811-12 the well known roof of the Halle aux Blés at Paris, described in many works (see also RONDELET, *Mémoire sur la Réconstruction de la Coupole de la Halle aux Blés*, 4to.); he was also the author of an essay entitled *Construction d'une Halle aux Vins*, etc., 4to., 1808; and of designs for abattoirs in the neighbourhood of Paris. He died 1 May 1818, in which year there appeared from the pen of his pupil M. LOISEAU, a *Notice Historique*, etc., 8vo., Paris, 1818, which has not been met with by the writer. 84.

BELECTION, see BALECTION MOLDING.

BELFAST. A seaport town in the county of Antrim, and the chief town of the north of Ireland. It is situated at the mouth of the river Lagan, which is crossed by two bridges, viz. the Queen's bridge, erected in 1842 (on the site of the old bridge, built 1682-6), at an expense of £21,000, consisting of five arches, each of 50 feet span; and the Lagan bridge, about half a mile up the river, in 1814. About £500,000 have been expended since 1839 in building the quays, and otherwise improving the harbour and docks, under the direction of George Smith, engineer; ILLUSTRATED NEWS, xv, 45. The town is supplied with water from three reservoirs situated at a short distance from the suburbs. Intramural burial has not been practised for the last fifty years, the cemeteries being outside the town. The streets are spacious, well laid out, paved, and lighted, and the houses well built of brick, and regular, many being very good. The town emerged from obscurity about the middle of the last century, and has since advanced greatly both in respect to its manufactures and its commerce. With the exception of a round tower in the neighbourhood, there are no remains of antiquity worth noticing.

The most remarkable places of worship are the following: S. Anne's church, erected in 1778, has a tower and cupola, and a portico of the Doric order: the seats, holding 1,100, are old and of mahogany. S. George's church, 1811-12, though otherwise plain, has a very fine tetrastyle Corinthian portico, which formerly belonged to Ballyscullen house (the Irish Fonthill, built by Lord Bristol, bishop of Derry); the church seats 1,200. May Street church, 1828-9, has a central recess sustained by two Ionic columns. Rosemary Street Presbyterian church has a Doric portico raised on twenty steps. Trinity church, 1843, is in a Gothic style, and has a spire 130 feet high. Fisherwick Place church, erected by Mr. Miller in 1827, at a cost of £10,000, has a tetrastyle Ionic portico, after the temple on the Ilissus at Athens. The Wesleyan chapel, Donegal Square, has a hexastyle Corinthian portico; S. Paul's Episcopal church, York Street, in the Early Pointed style, erected by Mr. Charles Lanyon in 1851, for 600 worshippers. There are also seven Episcopal, eighteen Presbyterian, six Methodist, four Roman Catholic, and four other places of worship.

The public buildings are built chiefly of brick with stone





dressings. The Queen's College, erected 1846-8 by Charles Lanyon, in the Tudor style, at a cost of £30,000, has a front 310 feet long, with sides 135 feet deep, and a central tower 98 feet high; *BUILDER Journal*, ix, 43; and *ILLUST. LONDON NEWS*, xviii, 117. The Ulster Institution for the Education of the Deaf, Dumb, and Blind, 1844-5, by the same architect, is in the Elizabethan style, and cost £8,000. The Royal Academical Institution, 1810, is a large plain building, being part of a design prepared by Sir John Soane, R.A.; one wing is occupied by the Government School of Design. The County Gaol, 1843, by C. Lanyon, covering an area of ten acres, is upon the model of the Pentonville Prison, London, to accommodate 450 persons; additions were made in 1849-50; the total cost was £58,000; the materials are black limestone with Scotch stone dressings. The Presbyterian College, 1852-3, by C. Lanyon, in the Palladian style (*BUILDER Journal*, x, 503), has four Roman Doric engaged columns with an Attic order, and Venetian windows at the sides; the flanks are somewhat similar; it is built of freestone from the Scrabo quarries twelve miles distant, at a cost of about £6,000. The Great Collegiate School, 1810, cost £25,000. The Belfast Incorporated Charitable Society's House, at the north-east end of Donegal Street, is a fine structure, with extensive wings and a handsome spire; it contains room for 432 inmates. The Fever Hospital was opened in 1817, for 200 patients.

The Custom House, in course of erection 1854, by C. Lanyon, at a cost of £35,000, in the Italian style, is of Scotch sandstone; the front is 200 feet. The Harbour Corporation House (1852-4), built of stone in the Italian style by George Smith, cost £7,000. The river front is 102 feet long and 48 feet high, by 51 feet deep; the public room on the first floor is 53 feet long, 21 feet wide, and 19 feet high, with a coved ceiling. The tower, nearly 90 feet high, has a clock with four faces, each 6 feet in diameter. The County Court House, 1848-50, by C. Lanyon, cost £22,000; it has a bold tetra-style Corinthian portico: the columns are 30 feet high, raised on a platform ascended by twelve steps. The Commercial Buildings, terminating one end of Donegal Street, were erected 1820, in granite, and cost about £20,000; the front has a basement supporting eight Ionic columns. The principal banks are; the Northern Banking Company's Offices, by C. Lanyon, forming an imposing structure of the Ionic order, built in Portland stone, at a cost of £14,000; and the Belfast Banking Company's Offices, which are in a modern Italian style.

The other buildings are the Old Exchange, containing a handsome assembly room; the Corn Exchange, by Mr. Jackson; two banks; a theatre, with a small but elegant interior; the Belfast General Hospital; the Lying-in Hospital; the District Lunatic Asylum, for 106 persons, which cost upwards of £50,000; the House of Correction; the barracks; and three railway stations; a Natural History Society, with a good house and a museum, etc.; the white and brown linen halls, etc.

The bricks are of a light red colour, soft, carelessly molded and burnt, and rather larger than the usual Excised English brick. Rubble work and common walling are generally built of the basalt which abounds in the neighbouring hills. Limestone is procured from Cave Hill. The quarries at Newtownards supply freestone of various tints, which is easily worked, but will not stand the weather. Some other particulars respecting materials will be found in the *BUILDER Journal*, x, 375 and 495; J. H. SMITH, *Belfast and the Giant's Causeway*, 8vo., 1853.

R. R. B.

BELFRY. The origin of this word shows the fact that, instead of containing the English term "BELL", as at first sight would seem probable, the term is only a variation of the old French word *belfroi*, meaning a bell as well as a tower. The term *belfroi* is used in France as belfry is in England for the frame of timber carrying the bell, and for the tower or steeple erected to contain it: the English also apply the word to the bell chamber, and to the bell ringer's room. **BELL TOWER.** 5.

ARCH. PUB. SOC.

BELFRY TURRET. A name given to a STAIRCASE-TURRET of stone containing an ascent by a newel stair to a BELL CHAMBER. Many ancient towers were ascended by ladders, and in a few cases wooden stairs are enclosed in wattled or boarded turrets constructed in the interior. Belfry turrets are usually placed in the south-west, rarely in the north-west, angle of towers: they occur also in the south-east and the north-east. They are generally polygonal in plan, project one-half externally from the wall, and have a small doorway into the inside. They are carried up either to the height of one or two stages, or to the belfry windows, and then weather off with a bold and picturesque slope, or rise above the parapet, and form a kind of castellated pinnacle turret, sometimes carrying a weathercock or pointed termination. Very frequently they are formed in the buttresses, which are as it were thrust prominently outwards by a bulging swell of the masonry in one angle, readily distinguished from the rest by its visible protuberance, and by small slits to admit light and air into the staircase within. Sometimes the head of the turret merges into a broach of the spire, an arrangement which gives an extremely bold and irregular effect. In very elaborate and splendid towers, one belfry window has been placed quite on one side of the centre of the tower, even though the belfry staircase which caused this remarkable irregularity was scarcely visible on the outside. Sometimes one of the four pinnacles of a tower is considerably larger and higher than the other three, because it forms a termination to a staircase-turret; some belfry turrets are corbelled off a little above the ground externally; occasionally the south-west angle is singularly prolonged into a wedge-like form from the internal formation of a belfry turret; and, as above stated, enlargements of buttresses even have been made in order to give room for the staircase. Further remarks and examples will be found in the *ECCLESIOLOGIST Journal*, iv, 262, from which the above notes have been abstracted.

BELGIAN WINDOW GLASS is a sheet glass, that is, cut from blown tubes, and is also called German sheet glass.

BELICARD or **BELLICARD** (JEROME CHARLES), born at Paris in 1726, gained the *grand prix*, went to Italy, and on his return became *contrôleur des bâtiments du roi*. He was admitted a member of the Academy of Architecture at Paris in 1762, acted as professor therein, and died 28 February 1786. He published *Observations sur Herculanum*, etc., 12mo., Paris, 1754, with plates executed by himself, and may therefore have been the Charles Bellicart, *inspecteur des bâtiments du roi*, and architect to the palace at Compiègne, who engraved the exchange at Lyons, and the church of S. Geneviève at Paris, after the designs of Soufflot. 45. 60. 83.

BELISARD (. . . .), admitted a member of the Academy of Architecture at Paris in 1776, was employed in additions to the Palais Bourbon, afterwards the Chamber of Deputies, at Paris. **LEGRAND** and **LANDON**, *Désér. de Paris*, 8vo., Paris, 1808. 45.

BELL. A term improperly used for the VASE of the capital of the Corinthian and Composite orders. **BASKET.** The same name is often given to the body of any capitals in Gothic architecture which may resemble the same form.

BELL. A hollow vessel formed for the purpose of producing, under percussion, a sound that is generally hoped may be musical; to have been cast in tune being one of the greatest merits now attributed to a large bell. Bells were formerly made of wrought metal, and sometimes with riveted pieces, but they are at present formed of a cast mixture called **BELL-METAL**. A bell consists of the ear or *cannon* by which it is fixed to the frame or **BELL-CAGE**, and of the body or *barrel*. The general proportions of the barrel are as follows: diameter at the mouth, 10; diameter at the shoulder, 5; height from mouth to shoulder, 8; one-fiftieth of the diameter being about the thickness of the *sound-bow* or part where it is struck by the *clapper*, which is usually made of wrought iron. **BELL-HANGING.** The manner of forming the pattern, the core, and the cope, is

described by GATTY, *The Bell*, etc., 12mo., London, 1848; who also gives a list of remarkable bells, as does likewise OTTE, *Handbuch*, 8vo., Leipzig, 1854, pp. 14-16. GRANVILLE, *Guide to St. Petersburg*, 8vo., London, 1835, i, 202, observes that cast iron bells for churches and clocks have been adopted in parts of Prussia; and approves their tone. Bars of cast steel, costing about thirty shillings each, have been recommended as better in respect to tone, when struck by a hammer, than the usual small church bells, costing three or four times as much. CAMPANILE.

In the Museo Borbonico at Naples there is a sort of bell found at Pompeii, consisting of a bronze perforated disk supported on an iron hook; when struck with its bronze clapper, it gives a loud and musical sound. A. A.

BELLAH. A light brown coloured wood of Canara, in the East Indies, from 2 feet to 3 feet in diameter, and from 10 feet to 24 feet in length, used for building purposes. 71.

BELLAI, in France, see BELLEY.

BELLAMINO renewed, in 1193 or 1198, by order of the consuls of Siena, the Gothic *Fonte Branda* in that city, as mentioned by FAMIN and GRANDJEAN, *Arch. Toscane*, fol., Paris, 1846, pl. 99; and according to TICCOZZI, he was subsequently engaged on the *dogana* and other edifices in that city. ROMAGNOLI, *Comi Storico-Artistici*, etc., 12mo., Siena, 1852.

BELLANGER, see BELANGER (FRANÇOIS JOSEPH).

BELL ARCH. A name given to a peculiar form of head for an opening, sometimes found in Continental Gothic architecture.



BELL CAGE. The technical name, shortened from "bell carriage", given to a timber frame, also called a BELFRY, carrying one or more large bells. A peal of church bells ordinarily has the spaces, in which the bells swing, so arranged that, while a heavy bell shall move parallel with one side of the bell chamber, two or more lighter bells shall swing in the direction of the adjoining sides: this arrangement being supposed to equalize the swinging force of the peal in each direction, and consequently the vibration of the tower. On the other hand, it is asserted that the vibration is not checked nor equalized by this arrangement, but that it tends to shake the four walls apart by a double vibration, wherefore it is said that all the bells should be parallel to each other, and so managed that when the heaviest bell is falling one way, the next in weight shall fall in the opposite direction. ELLACOMBE, *Practical Remarks on Belfries*, etc., 8vo., London, 1850, states that "it is not the downward pressure from the weight of metal, but the lateral pressure or vibration caused by the motion of the bells which does mischief, especially if any of the timbers are let into the walls or touch them laterally: to avoid this, a well constructed cage is trussed and braced with most substantial timbers; the weight of the whole, if properly rested on corbels or set-offs, keeps it steady: the higher the bells are placed in the tower, the more does the vibration caused by ringing them affect the masonry." Some difference of opinion exists, however, on this point, as it has been held that the timbers and girders, if bedded on plates laid in the walls, will most equally distribute the tremor, and that the vibration is not checked by the corbels. The design of a cage, and the scantlings of the timbers, form a subject rarely studied, except for the particular occasion on which the attention of the architect is required: the list of peals given in the *Builder Journal*, x, 27, 45, will assist in the search for parallel executed examples. If a cage becomes unsteady in the course of time, the best remedy is to drive oak or iron wedges at the backs of the tenons of the braces in the mortices of the sill pieces, etc.; but in many bell chambers the spaces between the walls and the ends of the beams belonging to the cage have been filled with wedges, a practice which is considered very prejudicial to the masonry. It has been recommended, perhaps on the supposition that the tremor would be checked at the points of support, that the belfry floor should always be formed of girders resting on corbels, and not placed on the main body of the wall; these

girders make a platform for the reception of the cage, the long sills of which should stand loose on loose floor boards, and in the same direction with the girders. BAKER, paper read at ROYAL INSTITUTE OF BRITISH ARCHITECTS, March 5, 1855.

BELL CANOPY. A canopy containing a bell "in harness", as illustrated below: or it may rest on side walls supported upon brackets projecting from



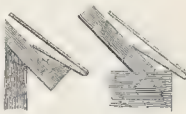
At Baden.

the face of a wall; as in the examples given in the *ARCHÆOLOGICAL Journal*, iii, 212, 213, from Godshill in the Isle of



Wight, from Welborne in Norfolk, and from Cleeve abbey in Somersetshire.

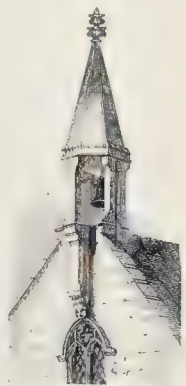
BELL CAST. The name given, especially in Dumfriesshire, to the means of giving to slating a tilt at the eaves, sometimes obtained by the brick or stone work, and sometimes by a feather-edged fillet. It is called at

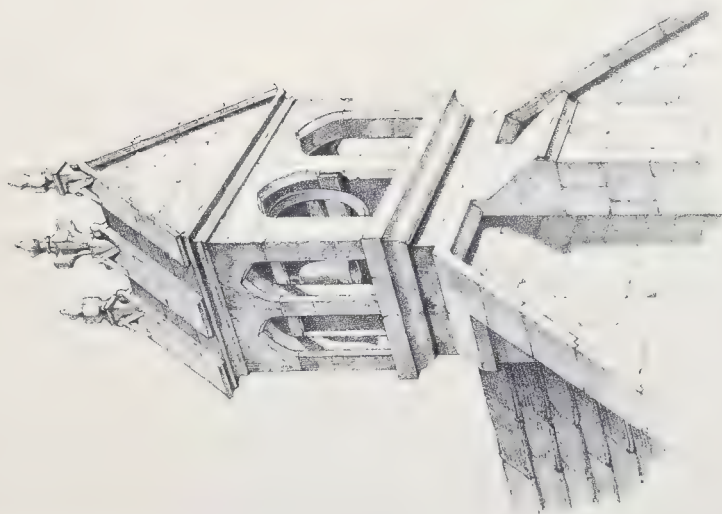
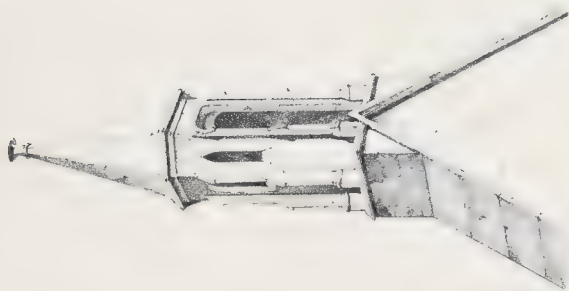
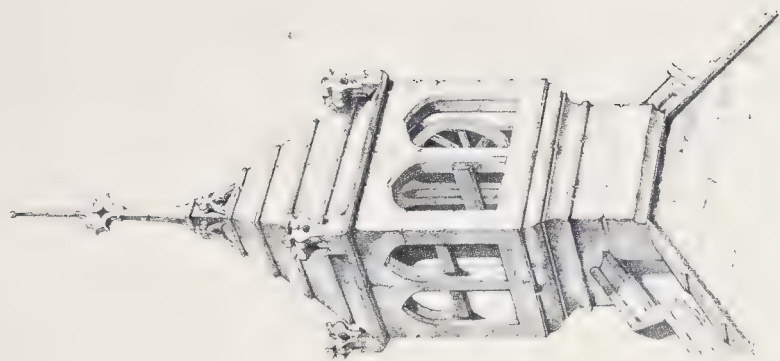


Leeds a BREAK, and at Manchester an EAVES POLE. W. R. C.

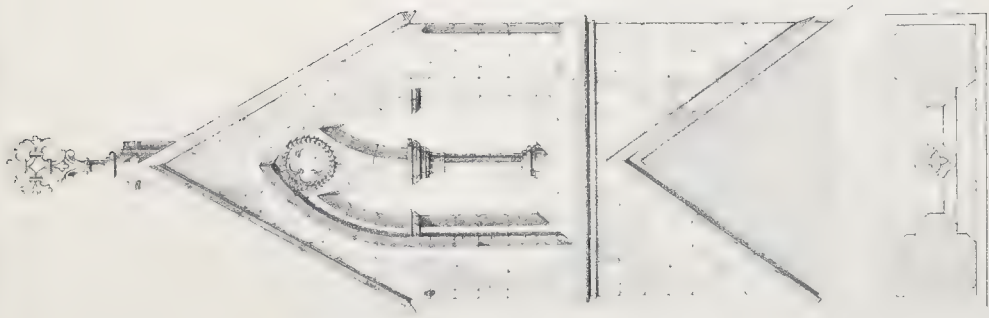
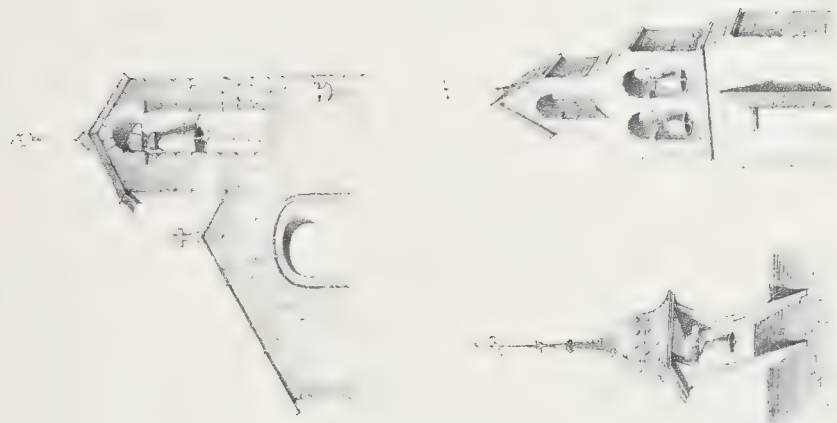
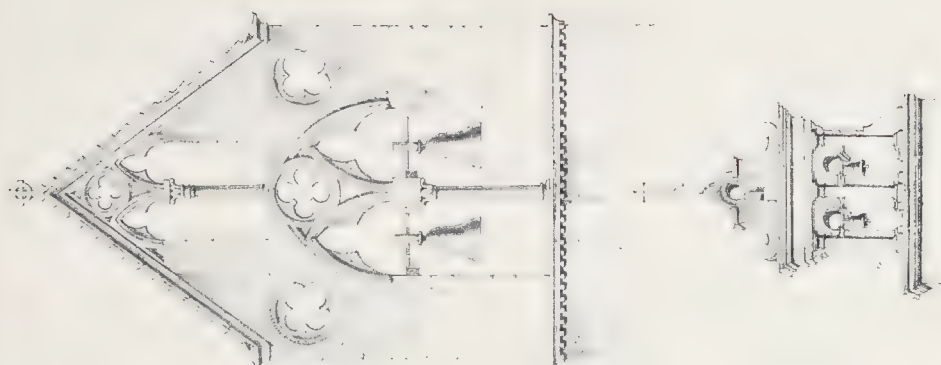
BELL CHAMBER. The room containing one or more large bells "in harness", i. e. hung to their cage or frame; the size of the apartment depends upon the arrangement of the bells. It has been above observed (BELL CAGE) that the higher the bells are placed in a tower, the more likely is the tower to suffer from the vibration caused by ringing them; but clock-makers generally insist on putting the clock below the bells, for the reason, it is supposed, that the tremor is there least perceptible, although the height of the bells from the ground is by this arrangement increased, and consequently the vibration of the tower. Local circumstances sometimes cause the bell chamber, distinguished externally by the size of the louvre-boarded openings, to be placed near the ground: in the Val d'Aversa, in the Oberland, it is put as low as possible, "that the sound may not ascend to the region of deep snows and so produce avalanches." The window-openings should be protected by wire guards, but these are so rarely provided, that bell chambers are generally rendered extremely dirty by birds, as well as damp from the want of sufficient projection and weathering in the louvre-boarding. Yet if they weather too much, the sound of the bells is impeded, and driving rains and drifting snow will always enter thereat; it has consequently been recommended that the floor should be covered with metal turned up against the wall, and having a small pipe to carry off the wet. There is ample cause for the supposition that many churches, burnt from unknown causes, have been consumed by a fire arising in this damp filth, either from ignition by lightning, or spontaneous combustion.

BELL COT, sometimes improperly called a BELL TURRET. A structure presenting the appearance of a steeple on a small scale, but so supported on corbels or by other means as not to affect the ground-plan of the building to which it belongs. Reference may be made to examples at Clifton Hampden in Oxfordshire; Dalmeny in Linlithgowshire; Corston in Wiltshire; Biddeston (destroyed), and Leigh Delamere in the same county, taken down and rebuilt 1846; at Acton Turville, Harescombe, Postlip, and Shipton Olliff, all in Gloucestershire, which will be found in











the *Journal of the Archæological Institute*, i, 36, iv, 99; in the *BUILDER Journal*, ix, 265, x, 136; or in the GLOSSARY. Two beautiful illustrations of continental design may be seen, one at Than in Alsace, given by GOLDBER, *Antiq. de l'Alsace*, etc., fol., Paris, 1828, pl. 31; and the other at Kerfeunton in Bretagne, shown in NODIER, *Voy. Pit.* (Bretagne), fol., Paris, 1846.

BELL CRANK, see CRANK.

BELLEY. A city in the department of the Ain in France. It was rebuilt by Amadeus VIII of Savoy, after having been destroyed, with the exception of the old cathedral, the episcopal palace, and the residences of the canons, in 1385. BOURASSÉ, *Cathédrales de la France*, 8vo., Tours, 1843, describes two cathedrals, one as exhibiting the style *Romano-byzantine*, also said to have been built by Frederick Barbarossa (1152-1190), and the other, which is comparatively modern, as built after the period of the *Renaissance*. These structures, with the *beffroi* of the cathedral dedicated to S. Jean; the *seminaire* and *college*; the hospital; the douane; and the museum, are the only objects of interest mentioned by the few travellers who visit Belley, with the exception of the remains of about six convents and monasteries; a suspension bridge at a short distance, which crosses the Rhone; and the quarries from which the best stone in France for lithographic purposes is obtained.

BELL GABLE. This part of a building has been improperly termed a BELL COT. Its simplest form is a wall and gable, pierced for the reception of one or more bells, and raised upon the truncated apex of a gable wall. Examples of such

single bell gables with one opening, as at Coombe and Holton in Oxfordshire, and Stoke Orchard in Gloucestershire, are common; they are generally found over the chancel arch, and are said to have been intended for the sanctus-bell only; sometimes such sanctus-bell gables are much enriched, as at Idbury in Oxfordshire, where the apex of the minor gable does not exist, being lost in the base of a pinnacle; and at Long Compton in War-

wickshire. Single bell gables with two openings, as at Little Coxwell in Berkshire, Glastonbury in Somersetshire, Long Stanton in Cambridgeshire, Howell in Lincolnshire, Northborough in Northamptonshire, Binsey, Forest Hill, and Toot Baldon in Oxfordshire, and Skelton in Yorkshire, are generally found upon the western wall of the building, but sometimes over the chancel arch: they are perhaps most usual in Rutlandshire; the instances at Manton and Whitwell in that county are familiar. The gable over the bell is frequently raised, and becomes a high roof, a spire, or a pinnacle, as at Barnwood in Gloucestershire, and Barton Lazars in Leicestershire. The county of Rutland also furnishes some of the best examples of the more decorative composition of a double bell gable, or wall with two gables, and two openings for the bells, as at Whitwell and Little Casterton; a similar design occurs at Penton Mewsey in Hampshire.

The term bell gable is also applied to a *main gable* pierced for bells, as at Corhampton, Littleton, and Ashley, in Hampshire.

Illustrations of the examples above cited will be found in the *Journal of the Archæological Institute*, iii, 206-210; in BRANDON, *Parish Churches*, 8vo., London, 1851; in the GLOSSARY, s. v.; and in the *Guide to the Architectural Antiquities, etc., of Oxford*, 8vo., Oxford, 1846.

BELL HANGING. The history of domestic bell hanging is told in very few words (which are here condensed) by a practical bell hanger in the *BUILDER Journal* (1852), x, 738. In the reign of queen Anne domestic bell hanging was not introduced; neither at Blenheim nor at Marlborough House

could any provision for bell hanging be found; and the same was the case at Warwick House, at Claremont, and at Hagley Hall. About forty years ago, Lord Brownlow stated that a bell at each end of the hall formed the means which his predecessors at Belton Hall had for summoning attendance, and added that, as it was getting into fashion to have bells from all the rooms, his house must have them. It is believed that domestic bell hanging has not been in use more than seventy or eighty years, and at that period it must have been done with a pulley and line, the bell ringing a short distance from the room. Iron wire with a bar-crank, not thicker than pasteboard, succeeded the line and pulley. Within recollection, copper wire was considered too expensive, and for many years was only used in the first mansions. The "secret system" of bell hanging, as it is called, is the technical expression for the now usual mode of carrying the wires and cranks in tubes and boxes concealed by the finishings of the walls; this sort of work has often been done carelessly, and has therefore produced great objections to the system. There is also culpable neglect when means are not provided for access to the work which, like all other mechanical action, requires occasionally to be oiled or repaired. The same writer adds, that "only brass or galvanised iron tubing should be allowed to be used in family mansions and other substantial buildings. Zinc tubing is not to be depended on; in some places it will moulder away and stop the movement of the wires; in other cases it opens, if not soldered, with heat under the flooring, and thereby causes the wires to work into the joinings of the tubes and stop the movement of the wires. The proper time to commence is when the lathing is to be done, or when the roughcast plastering has commenced it should no longer be delayed; the bellhanger will then have an opportunity of seeing his way much better, and prevent much cutting away of plastering, etc., and it is highly necessary he should receive proper orders as to the number of pulls required, from whence, and where they are to ring, as, should any extra bell be required afterwards, it produces a difficulty."

The BELL-BOARD generally placed outside but in view from the door of the servants' hall should be painted white, and have large black letters, as abbreviations for the meaning of the bell; in a well-finished house the bells placed on that board are so tuned as to form a musical scale. In 1848, several persons claimed the invention of an arrangement which has been extensively adopted in the United States, and to some extent in England; it consists of a square picture frame enclosing a panel on which a space is left for the number of each apartment, and when the wire which communicates with the bell handle in the room is pulled, the bell of the picture frame is struck and a number is either disclosed or covered (according to the system adopted), showing where attendance is required; the usual use of this system is to send, as in the theatre at Barcelona, all demands to a central authority, which by speaking tubes directs the attention of the proper domestic; but except where labour is subdivided to any great extent, the system requires sets of wires from other pulls to other frames, showing the departments from which attendance is required. *BUILDER Journal*, viii, 94, 141.

W. H.

A great portion of the mischief to which bell towers are exposed arises from the too often unscientific manner in which the bells are hung; BELL CAGE. The hanging of a large bell is an art of itself, and many traditional precautions are supposed to be preserved by those who make a study of the rules and principles upon which the various parts of the bell and its harness are designed and manufactured by them. ELLACOMBE, *Practical Remarks on Belfries and Ringers*, 8vo., London, 1850; two illustrations of a large bell in harness are given by this author in the *BUILDER Journal*, x, 331. LUKIS, *On Church Bells*, in *Transactions of Wiltshire Archæological Society*, 1854. BAKER, *Paper* quoted in BELL CAGE.

BELLI (PASQUALE), the son of Giambattista, born at Rome



At Little Coxwell



At Little Coxwell

3 December 1752, was a pupil of Camporese and Antinori. He built the seminario at Nola; was employed at Meldola, Foligno, Tivoli, Terracina, Valmontane, and other places, sometimes as an engineer; was elected into the Academy of S. Luke in 1810; became the head of the commission for the preservation of antiquities; designed the works executed by Brizzi for the lowest chapel of the church of S. Francisco at Assisi, in which the relics are now deposited; in 1825 was commissioned to restore the basilica of S. Lorenzo fuori le Mura at Rome; and designed the fronts of the churches of S. Andrea delle Fratte and of Sta. Maria della Consolazione in the same city. He died 31 October 1833, and was buried in the academical church of Sta. Martina. BETTI, *Notizie intorno alla vita e alle opere di P. Belli*, 8vo., Rome, 1833. 99.

BELLI (FRA PIETRO PAOLO), a Dominican lay-brother, born at Jesi in the March of Ancona, directed the restorations in the church of his order at Ancona, for which he did not furnish the designs; in 1791 he restored various fabrics belonging to the Dominicans at Pesaro; and in 1794 the church Degli Angioli at Novillara; he also designed and commenced in 1797 the new church of his monastery at Pesaro; the work was soon suspended on account of the troubles of the time, but was recommenced and completed in 1806. He died in 1807. 87.

BELLICARD, see BELICARD (JEROME CHARLES).

BELL METAL. A hard, brittle, dense, and vibratory amalgam. French bell metal generally contains 78 parts of copper to 22 of tin; and this seems to be a traditional proportion, it being supposed that 75 parts of copper and 25 of tin was the receipt employed in Europe until the fifteenth century, when bells are said to have been cast of a mixture made with 60 of copper, 20 of silver, and 20 of tin. During the last century the English average is stated to have been about 83 of copper and 17 of tin; a modern formula appears to have prescribed 50 of copper, 33 of zinc, and 16 of tin; but present proportions approach nearer to the ancient system, 75 of copper and 25 of tin being the basis of the amalgam employed by each founder, with the addition of other metals in quantities peculiar to his practice; thus some English bells contain about 80 of copper, 10 of tin, 6 of zinc, and 4 of lead; but when the latter is employed to such an extent, it is found to form isolated drops in the alloy, which destroy the homogeneity of the metal; it is stated by several authorities that any metals, except the copper and tin, are rather prejudicial than otherwise. The bells for French *pendules* consist of 72 of copper, 26.50 of tin, and 1.50 of iron. ALLOY, BRONZE, COPPER. English common bells differ considerably in their construction from the usual church bells; they range from 66 of copper and 33 of tin, which is called "speculum metal", (and is indicated by an entry in the Liberate Roll of 26 Henry III, § 12, by the order for 1050 lbs. of copper and 500 lbs. of tin, to be melted up with an old bell), to 83 of copper and 17 of tin, as above mentioned. An alloy formed of 80 of copper and 20 of tin, or of 78 of copper and 22 of tin, is used for cymbals and similar instruments, and is the bell metal of commerce. LUKIS, as reported in the *BUILDER Journal*, xii, 519. MARTIN, *Circle of the Mechanical Arts*, 4to., London, 1813, p. 354. W. H.

BELLONI (GALETTI DEI) is mentioned as an architect engaged upon the *duomo* at Milan, 21 March 1401. 27.

BELLONI (GIUSEPPE), who died in 1654, built the custom house (*dogana*) at Venice, which is engraved in Carlevari's collection, and made the drawings for the work by RASPONI, *De Basilica Lateranensi*. 60. 68.

BELL ROOF. A roof shaped, as in the illustration given in BELL ARCH, somewhat similarly to a bell; the section "being a curve of contrary flexure, convex at top and concave at the bottom, similar to an ogee or cima recta roof." 2.

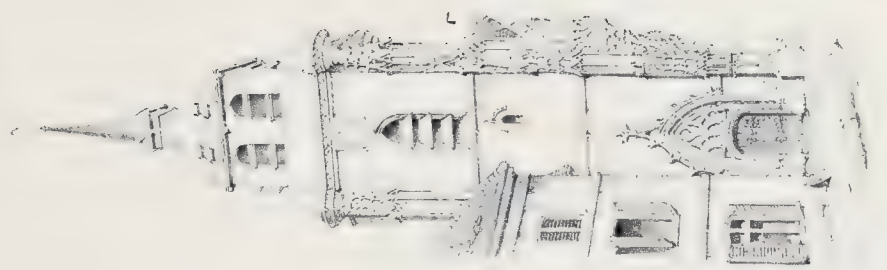
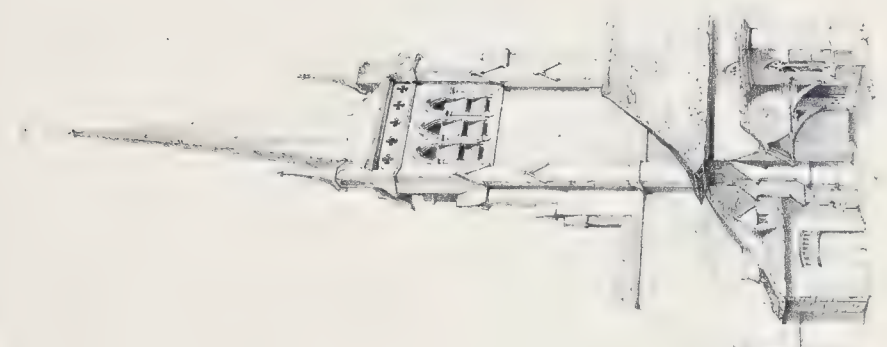
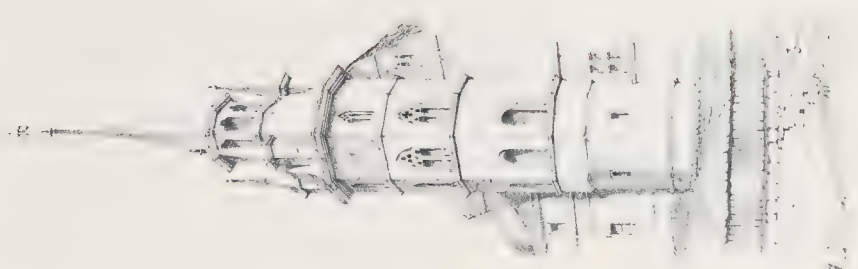
BELL TOWER. A structure erected at the present time for the purpose of containing a BELL CHAMBER and its adjuncts. When attached to a church, the lower portion is often used as

an entrance porch, and in modern times as a vestry. Some of the early towers were probably not at first especially intended for bells, as in the ancient plan of the monastery of S. Gall (BENEDICTINE BUILDINGS), the towers are described "ad universa superinspicienda". The Italian word CAMPANILE, adopted in this country, and the German term *Glockenthurm*, mean a bell tower, either for civil or ecclesiastical uses; but the French terms BEFFROI and CLOCHER designate these purposes respectively.

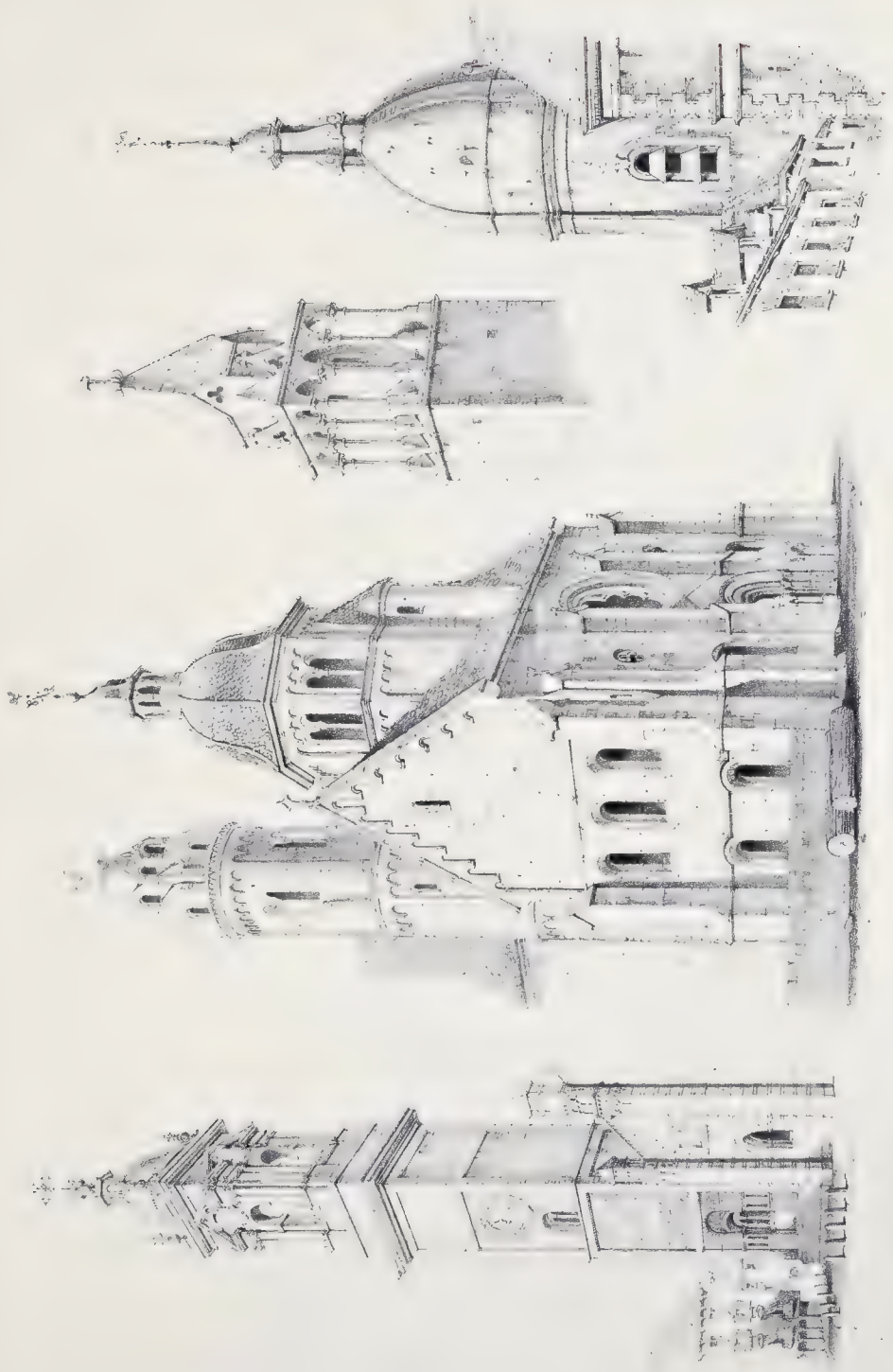
THIERRY, *Lettres sur l'Histoire*, 8vo., Paris, 1842, xiii, and xx, shows that when the townspeople at Rheims formed themselves, about the year 1138, into a *commune* or corporation, the council of the burgesses sat in the nearest large church, the bell in the tower of which served for the *beffroi communal*, at whose sound the townspeople assembled. The same author mentions the obstruction given by the ecclesiastics to such uses of the church and its adjuncts: consequently in the twelfth century, the attention of the great cities in the *domaine royale* or north of France was given, so far as building was concerned, to scarcely any other objects than their ramparts and their *tours de beffroi*: which, however, became useless to them in the following centuries. But in Holland and Belgium each *commune* erected, at some period in the thirteenth or fourteenth centuries, or even in the fifteenth, its *hôtel de ville*, generally having a *tour de beffroi* forming a considerable, if not principal, feature of the edifice; serving as the watch tower in any fortified town, and containing a bell or bells to be used upon particular occasions. In England the bell tower is generally found forming a portion of a church or other building; while wholly detached bell towers are occasionally found, as at Fleet in Lincolnshire, Marston-Morebaine in Bedfordshire, West Walton in Norfolk, Evesham in Worcestershire, Berkeley in Gloucestershire, Chichester in Sussex, and Ledbury in Herefordshire; at Pembroke, in the last named county, the belfry or cage, which stands upon the ground, is cased with boards, and forms a detached wooden bell tower. It should be observed that some writers suppose that these towers were not originally detached structures, as at Beaugency in France, where the beffroi once belonged to the church of S. Firmin, and is now attached to the Hôtel Dieu; but the example at Fleet, in which the church and the bell tower are both of the same early Second Pointed style, would seem conclusive against this view. FORESTER, *Norway*, 8vo., London, 1850, p. 386, mentions the detached wooden belfry at Vaage, which suggests a reason for the existence of expensive towers in isolated positions.

The isolated church bell towers of Germany are those of S. Mary, in the capitol at Cologne; S. Emeran, and the Obermuenster, at Ratisbon; S. Bartholomew, both at Kolin and Zerbst; the kloster kirch at Arndsee; the church at Luckenvalde; the Perlach thurm at Augsburg; the Rothe thurm at Halle; and the tower of the kloster kirche at Petershausen, near Constance.

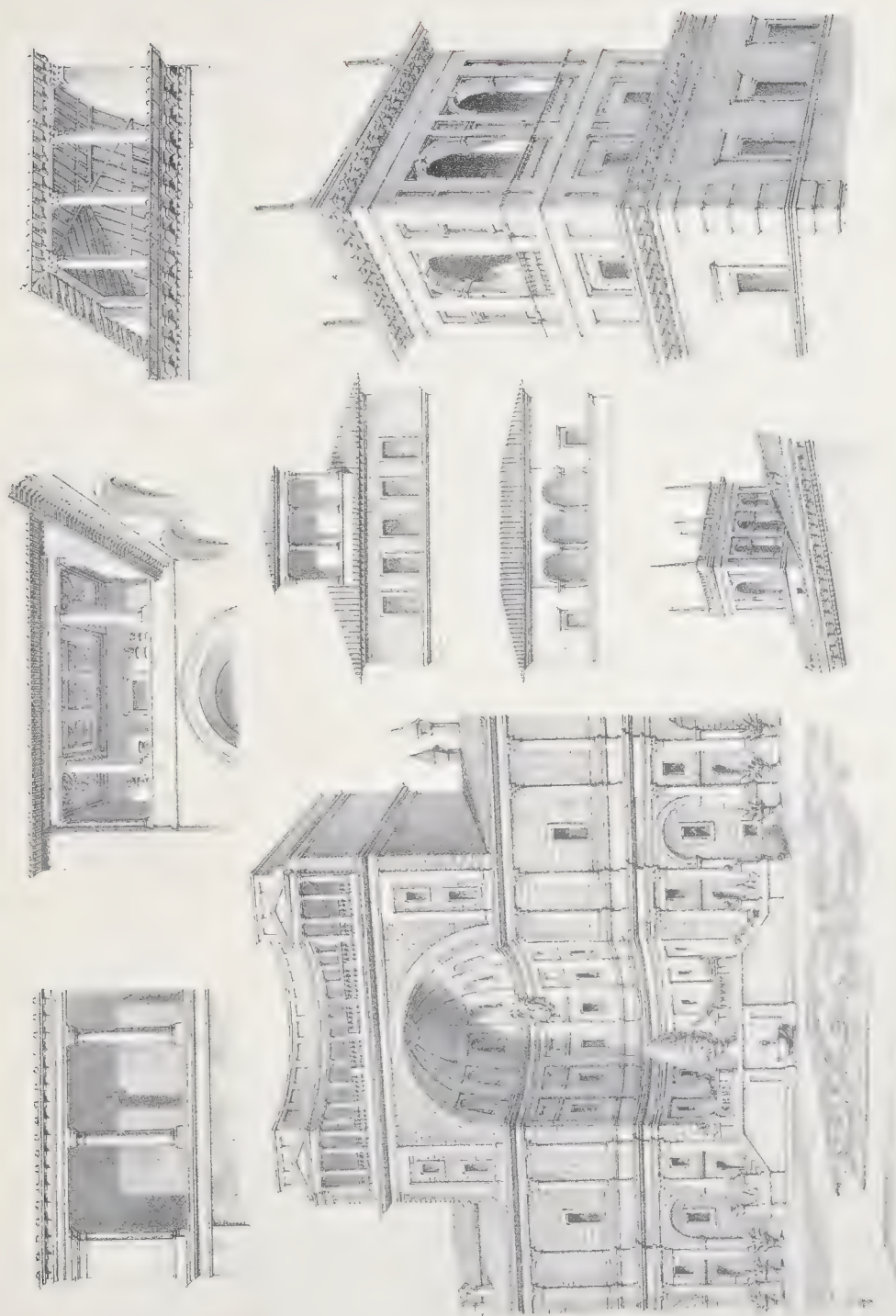
BELL TRAP. A contrivance, usually air-tight, consisting of an inverted cup the edges of which dip into a trench, gutter, or canal holding water and formed at the top of a pipe, for the purpose of preventing foul smells ascending from the drain into the air. It is applied to sinks, paved areas, and scullery floors. Bell traps are sometimes fastened down, but are generally left loose, because many substances pass through the grating or strainer of the trap surface, and refuse to pass the trap; as they either float and cannot sink under the lip of the bell, or they sink in the trench or well at the standing end of the pipe, so that the escape becomes choked, and the trap requires to be lifted out of its place for the purpose of clearing the well. HOSKING, *Guide to the Proper Regulation of Buildings in Towns*, 12mo., London, 1848, says that to solder down bell traps is to render sinks useless, unless they are protected from the access of such obstructions, or a means is devised of clearing them away. The same author mentions the use of





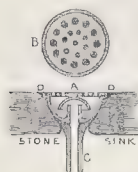








a wire strainer, and adds that a long funnel will give such a head of water as to clear the pipe if choked. The trap might be soldered down, if the surface were pierced with holes so small that nothing but fluids could pass; and many persons, finding that the bell is occasionally removed for a considerable time in order to sweep large refuse down the pipe, so that much foul air ascends into the building, cause the bell to be fixed in



the trap. It is generally supposed that a bell trap is air-tight, but this is not the case when there is an upward pressure in the pipe sufficient to drive the foul air into the hollow of the bell, and thence force it through the water, and above the sink stone. A, is the grating or strainer, to the underside of which the bell is attached; B, the plan of the upper side; C, the waste pipe soldered to the underside of the trap or cup; and D D, the top of the cup soldered to the sink stone.

JENNINGS' BELL TRAP, fig. 2, can be used with or without the grating; as the bell forms a fixed portion of the trap, its effectiveness is secured as long as water remains in the cup.



BELL TURRET. A tower of small diameter, but often lofty, in which last respect it may rise not only to any point at which the bell, which it is to carry, may be hung, but to any extent of plain or ornamental termination above that point that may be desirable. Bell turrets are generally octagonal, but are rarely found pure and simple in old structures, because advantage has often been taken of an opportunity to hang a bell at the top of a staircase, and thus one turret serves a double purpose. In many edifices, however, erected during the present century, a turret only large enough to hold a bell and its cage is introduced, and a corresponding one without a bell is frequently added, for the sake of uniformity. The building holding the great bell at Christchurch college in Oxford, is one of the finest examples in England of the olden bell turrets. Some small western towers have been considered as occupying an intermediate place between bell turrets and bell towers, and they may perhaps be properly referred to the former class: such is that at Nun Monkton in Yorkshire, illustrated in the *Journal of the ARCHEOLOGICAL INSTITUTE*, iv, 131. That of the church of S. Helen at York, given in the same *Journal*, iii, 211, is therein called a LANTERN BELL TURRET.

BELLUNO (the ancient *Bellunum*). The capital of the province of the same name in Austrian Italy. The city is well laid out with wide streets, surrounded by high walls, and amply supplied with water by an aqueduct six miles (?) in length. The cathedral, dedicated to S. Martino, is said by some writers to be the work of Palladio, but it is not mentioned among his Bellunese works, in the elaborate life of that architect by MAGRINI, *Memorie*, 4to., Padua, 1846; by others it is ascribed to Tullio Lombardo (cir. 1500); and these authors assign the very high campanile to Filippo Giuvara. The church of S. Stefano is in a pseudo-Gothic style; that of S. Pietro is a modern work, by Brustolone. The episcopal palace is built upon an old castle. The other principal buildings are the *palazzo Pretorio*, and *palazzo della Città*; the former church of the Jesuits, built by Andrea Pozzo, is now a barrack. Besides the two churches above named, there are eleven other parochial churches, and the remains of a convent and three monasteries; only one convent (Benedictine) exists in the town. The *seminario*, *gymnasio*, *liceo*, and the hospital, are also mentioned as deserving of attention. DOGLIONE, *Notizie*, Belluno, 1816. w. h.

BELLY. The hollow part of bent timber, the convex part of which is called the back. The enlarged portion in the contour of a pear-shaped baluster is also called the belly. 23.

BELLY BOARDS. The name under which Swiss deals (probably the produce of a larch) are imported; they are used for the sounding boards of musical instruments. HOLTZAPFEL, *Catalogue of Woods*, etc., 8vo., London, 1843.

ARCH. PUB. SOC.

BELT. The name formerly given to a band, STRINGCOURSE, or *stone-string*, as it was also sometimes called.

BELTRAM (PEDRO) constructed the new convent of the Observantine Hermits of S. Augustine at Barcelona, in 1718: this building, which is the largest of its kind in the city, has a church with a façade of five arches between six columns, in the style of the time. 66.

BELVEDERE. An Italian word used to denote a sort of cupola, lantern, or turret, erected upon the roof of a house for the purpose either of obtaining purer air or an extended view. The term is also applied to a little hillock formed with a level top, and placed at the ends of gardens, about a hundred years since, upon which a seat or open tent, or even a temple, was often erected. The term is sometimes applied in Italy to open galleries, corridors, or loggias. 2. 5. 23.

BEMA (Gr. *βῆμα*). The Greek term for a step in walking, and thence a measure of length (thirty inches), now called a geometric pace. It appears to have been afterwards applied to any place like a hustings or platform, such as a rostrum (*tribune* in the chambers of the French legislative bodies), and a portion of the orchestra of a theatre. Upon this was sometimes placed the *ambo*, the *sella curulis*, or the *pulpitum*; but the bema of the Pnyx at Athens seems not to have had any. Probably the only existing bema or *tribunal* is in the basilica at Pompeii. After being thus applied, as at the Pnyx at Athens, to the place from which speakers addressed the assembled people, the word was used for the elevated floor or stage from which decrees were pronounced, and thus came to signify the *tribunal* of a person, as a tribune, in authority. It was therefore appropriately employed in the early basilican churches for that portion of the nave, which was raised above the general level of the floor and enclosed by a railing or screen; the space within was particularly allotted to the clergy. After the throne of the bishop and seats of his presbyters had been placed in the apse, the word bema still remained the legitimate designation of that portion (*sacrarium*, chancel, or even apse) which, until the development of the choir, contained the ambones as well as the altar.

BEN ABDALLAH BEN MUZA (AHMED) is commemorated in an inscription given by CONDÉ, *Historia de la Dominacion*, etc., 4to., Madrid, 1820, i, 496, as governor, *sahib zarta* (chief of the police), and cadi of the towns in the Cora or Comarca of Ecija and Carmona, and as the "artífice" of the great aqueduct of Ecija in Spain, executed under him for the mother of king Hixem, and finished A.D. 978.

BEN ABDALLAH (MUSLIMATOU), see BEN YOUNAS (ABD.)

BEN ABU BARBUSTAR (EL ALFAKI ALCADI ABUBEKER), is commemorated in an inscription at Mertola in Spain, as having superintended the execution ("cuidó de la construccion") of a tower, finished 1171, in the fortress of that town. 66.

BENARES (originally called Varanashi "the splendid"). The capital of the district of the same name in Hindostan. It is not only considered one of the most ancient towns in India, and the Athens of that country, as being the central seat of Hindoo learning; but is held to be the most sacred by the Hindoos, as it contains their principal pagodas, and the dwellings of their most celebrated and revered brahmins; while its opulence and magnificence entitle it to rank among the principal cities of the world. No written description, however elaborate, can convey even a faint idea of the extraordinary peculiarities of a place which has no parallel in the East. The town, about a mile in width, is situated on the western and convex side of a curve of the river Ganges, and extends about three miles along the bank, which rises to about 40 feet above the water, and thus the buildings appear very lofty to the passenger on the river, but are in danger of being ultimately swept away: views of the city in 1823 show several small pagodas standing in the water, and one of them so much undermined as to threaten immediate destruction. The face of the city toward the river is, however, protected in some slight degree by a line of temples and palaces with splendid ghats or

"stairs", and is thus rendered majestic to those who are not aware that many of the apparently splendid buildings are only façades which serve as retaining walls, chiefly to large gardens. In dropping down the stream in a boat, an almost endless succession of interesting objects is presented to the eye. Through the interstices between tower and palace, temple and serai, glimpses are caught of gardens and bazaars stretching inland; an open gate displays the terraced resort of some wealthy noble; long cloistered corridors lead to the secluded recesses of the *zenana*; and small projecting turrets, perched upon the lofty battlements of some high and frowning building, look like the watch tower of a feudal castle. ASIATIC JOURNAL, new series, x, 336. Considerable damage was done, not only to these buildings, but to the houses for some distance beyond them, by the explosion of a fleet of 3,000 barrels of gunpowder, on the 1st May 1850. ILLUSTRATED LONDON NEWS, xvii, 15.

The streets are so extremely narrow that it is difficult to pass through them in carriages, and in a few cases houses are even connected by galleries with those on the opposite side of the street. The usual style of building for the wealthier Hindoos in Benares ensures the strictest privacy to the female portion of the family. The massy door from the street opens into a small courtyard, surrounded on all sides by high walls; one large apartment occupies the whole of the front, in every story; these rooms, which are airy and well supplied with windows and verandahs overlooking the street, are exclusively occupied by the gentlemen of the house. On each floor a covered gallery runs round three sides of the courtyard, leading to small chambers, or rather cells, wherein the females and their attendants reside. These of course have no outlet to the street, and look down upon a fountain, if the quadrangle below be neatly kept, or upon the goats and cows, which frequently occupy the ground floor. Some of the interiors of these houses are decorated with richly carved woodwork highly polished. There are many such houses of large dimensions, but it is customary in Benares for each story to be tenanted by a family, and some of the buildings are said to have in this way two hundred inmates. The stone or brick dwellings, from one to six stories high, are calculated at 12,000 in number, and it is said that there must be at least 16,000 with clay walls.

The buildings have been apparently intermingled without any fixed plan or intention, yet form altogether an architectural display of the most striking and imposing nature. The florid ornamentation in stone and woodwork spread over the fronts of the dwelling houses, and the richly sculptured stonework with which the small but exceedingly beautiful antique pagodas, abounding in every direction, are adorned, give evidence of the talent and skill of the artists; yet, notwithstanding the immense sums lavished upon its pagodas, Benares does not present a single specimen of those magnificent temples which, in other parts of India, convey so grand an idea of the vast conceptions of their founders.

The Jumma Musjid, or great mosque, with two minarets rising 232 feet above the water's edge, and three domes of white marble, was built by Aurungzebe on the site of a highly venerated pagoda which he demolished. Only adventurous persons, who can climb the light cupolas which crown these lofty towers, see the city of Benares. They perceive that there are wide spaces between the seven-storied buildings that form a labyrinth of lanes, and that gay gardens flourish in the midst of dense masses of bricks and mortar. In the Visvashwar pagoda are the celebrated columns which, seen by a prejudiced or undiscriminating eye, were pronounced, from the engraving given by HODGES, *Travels*, 4to., Lond., 1793, p. 62, to be works of ancient Greek art; and have served to carry many hypotheses as to their date and sculptor. The other chief structures of interest are, the observatory said to have been built by Akbar, and illustrated by Sir ROBERT BARKER in *Philosophical Transactions*, lxvii, 598; the custom house; and a LATH. The great number of fine buildings arises from the fact that nearly every

Hindoo chieftain maintains an establishment in Benares, and that the construction of a ghaut with its attendant buildings is esteemed an act of charity.

Exclusively of the grandeur of the appearances which the city of Benares exhibits as seen from the river, a number of other objects of great architectural beauty are to be found in the environs of the town. Pagodas of all sizes and descriptions, with tanks on a noble scale, accompanied by topes or groves of the banian, and a variety of the richest foliage, offer views highly interesting and beautifully picturesque. The palace of the rajah of Benares is at Ramnuggur, about one mile above the city, and on the east bank of the river; where is also a superb temple, built by order of Cheyt Singh. The English chiefly reside at Secrole, or as it is now written Seroli, about two miles from Benares, in which are the courts of justice, and some of the best European houses in India. PRINSEP, *Benares Illustrated*, etc., fol., Calcutta, 1831.

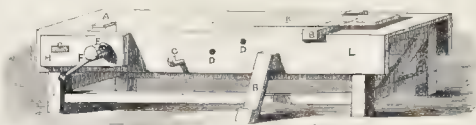
BEN AYOUB (SAID) is commemorated in an inscription given by CONDÉ, *Historia de la Dominacion*, etc., 4to., Madrid, 1820, i, 446, 447, as "*el arquitecto*" employed A.D. 958, to decorate the *patio* or court in front of the Djama or mosque at Cordova. But BATISSIER, *Histoire de l'Art*, 4to., Paris, 1845, p. 420, mentions this artist as having been also engaged seven years previously in the erection of the new tower, and next in the decoration of that mosque.

BEN BATU (EL WASIR Y HAGIR DE PALACIO ABDALLAH) is named in the above inscription with SAID BEN AYOUB.

BENCH. The term given to the part of a court of justice allotted to the presiding magistrate. It is not simply the seat, or collection of seats, but rather corresponds to the ancient BEMA, or tribunal; and therefore signifies in the chief courts of law in this country a platform, with the necessary number of seats and desks, and a reared or screen, in the design of which some contrivance is necessary.

BENCH is also the technical name for the table, from 10 feet to 14 feet long, 2 feet 3 inches wide, and 2 feet 8 inches high, properly fitted, at which work is done by carpenters, joiners, and others.

W. H.



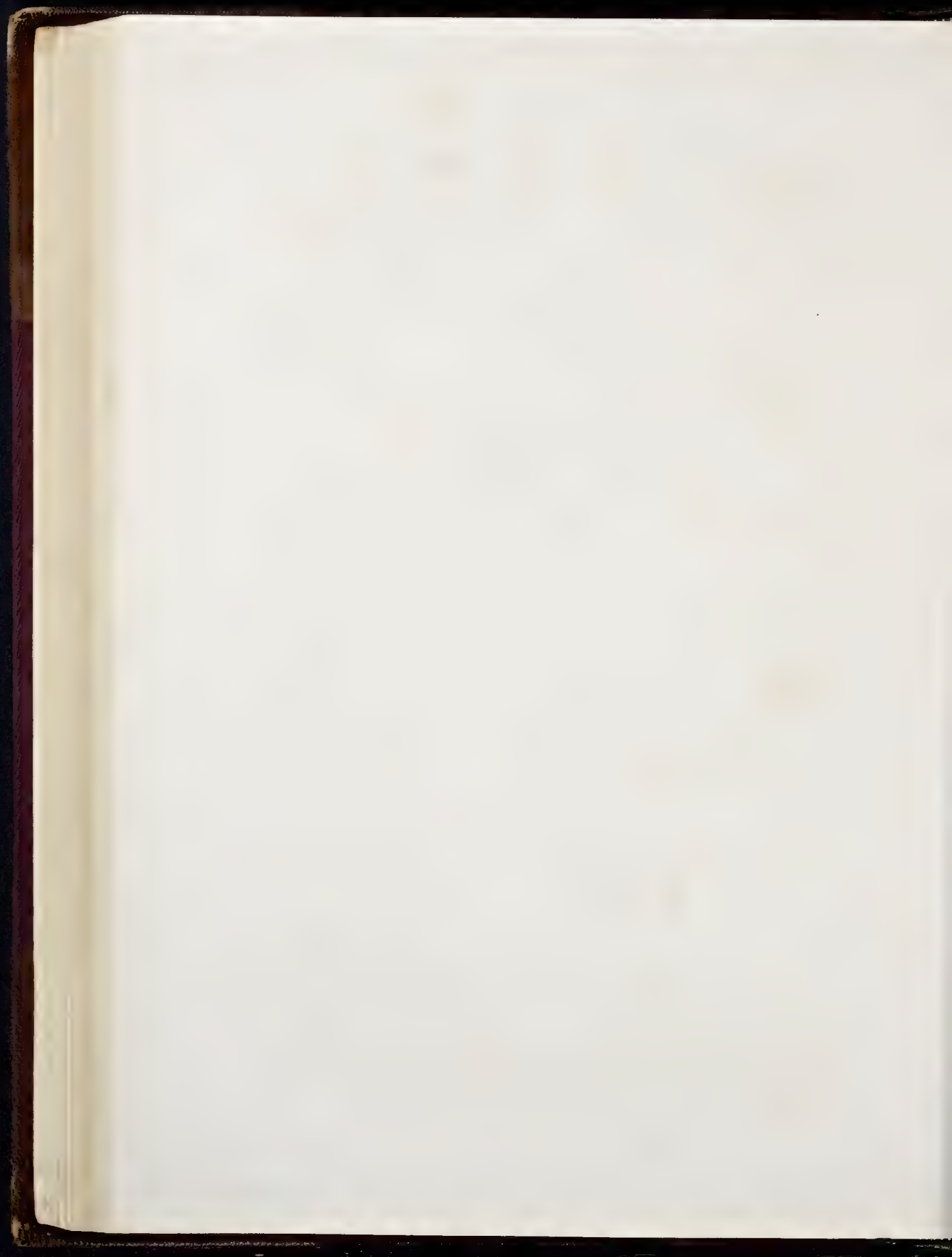
In the accompanying illustration, L shows the screw-board, receiving the bench-screw, the guide, and the bench-pin. The bench-pin, C, fits into holes, D, pierced in the screw-board; the head of the pin is enlarged on one side, and thus, when a deal is to have one end confined by the bench-screw, it has the other end previously supported and clamped by this pin, which is raised or lowered as necessary. The vice consists of three parts, viz. the screw, E, which is worked to and from its nut, fixed behind the screw-board, and has a lever or wrench, F, at the other end; the guide, G, also passing through the screw-board, and confined in a groove beneath the bench; and the cheek, H, kept parallel to the bench by the screw passed through it, and the guide fastened into it. The bench-stop, A, is a wooden plug or pin, about 2½ inches square, fitting sufficiently tightly to remain in its hole so much above the surface of the bench as it may be left, after having been raised or lowered by a few strokes from a mallet; wood that is being wrought longitudinally is pushed against this stop, and so attains a resistance to the plane or other tool. The stop is sometimes mounted with a piece of iron forming teeth which catch the stuff; in cases of emergency, one or more nails or screws, driven into the bench, are used instead to form a stop, and are so called. A means of giving abutment to wood that is being wrought transversely is the bench-hook, B, which is a piece of wood about 14 inches

PINCH END



TABLE M - 1856
P. 1

Printed by the Architectural Publication Society, New York



long, having a ledge at each end, but on opposite sides. When laid upon the bench with one ledge pressed against the screw-board by the force with which the workman pushes from him a piece of wood, as *x*, which he is working, the resistance of the other ledge steadies the stuff, and at the same time the thickness of the body of the hook raises the stuff off the top of the bench, and this is convenient when ends of framing, tenon-checks, etc., are to be sawn off.

BENCH MARK. The term in surveying applied to a mark showing the starting point in levelling along a line, and to similar marks affixed at convenient distances, to substantial or permanent objects, to show the exact points upon which the levelling staffs were placed when the various levels were read, thus facilitating reference and correction. The cut shows the mark used by the Ordnance surveyors.

W. H.

BENCH PLANES. The planes so called are the single and the double ironed jack planes, the trying, the long, the panel, and the smoothing PLANES, and the jointer.

A. A.

BENCH TABLE or BENCH TABLE STONE. A projecting course of stone, generally having the lower half of its



thickness chamfered, and forming a low seat against the walls of buildings in mediæval and Italian architecture. It is often found continued round the bases of attached pillars, both as a seat and as a mere footstall.

17.

BEN COLAIB (or **BEN KLAIB**) **BEN THABITA** (**EL AMIL ABDALLAH**) is commemorated as an architect in an inscription dated A.D. 835, upon the fortress at Merida, together with Giafar **BEN MOUHAZIN**.

Abdallah BEN COLAIB is also commemorated in like manner in an inscription dated A.D. 945, upon an edifice at Tortosa, together with **Abderrahman BEN HAMID**.

66.

BEND or **BENDT**, see **BUND**.

BENDING TIMBER. In consequence of the difficulty of procuring what is technically called *natural growth* timber, of the forms required to meet some of the wants of the carpenter, joiner, or ship builder, it is frequently necessary to resort to artificial means of bending wood to the desired shapes. The modes in which this operation is effected are extremely various, and the choice of the precise system to be adopted must be regulated by the use to which the wood is to be applied.

It has been attempted to procure, artificially, a modification in the growth of trees, for the purpose of obtaining *compass timber*, by training the young shoots in a direction which should cause them eventually to grow into the desired form. This idea, which has been the chief cause of so many trees being chained to some other object, has been very generally abandoned of late years; but it would be difficult to discover any other reason than the consequent deformity of the trees as objects of luxury for neglecting so simple a method of attaining a very desirable object. Evidently if an old shoot be operated upon the fibres would be strained, and perhaps the vitality affected; but young timber easily adapts itself to the form it is made to assume, and can with equal facility be made to develop itself according to the outline thus given. The only precautions which may be necessary in such cases appears to be that sudden and violent changes of direction should be avoided, and that the sap vessels of the wood be not ruptured.

Timber is bent either by mechanical efforts, applied without exposing it to any chemical action to modify its resistance, or

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after softening by the heat of open fires, warm water, steam, or damp sand.

The operation of bending timber by exposing it to the action of open fires is principally resorted to by cabinet makers, coopers, and boat builders. It is very inefficient, so far at least as important works are concerned, because it can only be applied to thin slabs, and the effect of the heat can never be distributed in a sufficiently equal manner to ensure the same degree of suppleness throughout the plank. When the wood is bent after being softened in boiling water, the last named objection cannot be said to exist to any appreciable extent; but it appears that some of the constituent elements are dissolved by the process, and that the material not only loses in hardness, but also becomes liable to shrink, and to decay with greater rapidity. This mode of bending timber is rarely used by others than ship builders, nor is it often applied to large scantlings. Of late years steam at high pressure has been applied for a similar purpose with considerable success, so far at least as the mechanical results are concerned; but it must be evident that the objections to the use of warm water must equally apply to that of steam. Indeed, as the action of the latter is more subtle and intimate, so to speak, it must affect the structure of the wood in a greater degree. Damp sand has been occasionally used instead of water for the purpose of bending timber, but the difficulty of maintaining the requisite degree of temperature in it has prevented its being practically applied on a large scale. At L'Orient some experiments were made to ascertain the precise effect of high-pressure steam in facilitating the curvature of wood, from which it appeared that a stick of oak, about 8 inches square and 29 feet long, after being exposed to steam, at a pressure of about 30 lbs., for the space of twenty-five hours (of which only fifteen were strictly of value, because the fire was let out at night), was bent with ease upon a mould of 25 feet 4 inches development, and 2 feet 10½ inches rise. The timber was left on the mould for sixty-four hours; and, upon being withdrawn, it returned only three inches towards the straight line. A few shakes in the wood opened during the operation; it would therefore appear desirable to use a plate of thin iron on the convex side of the rib, in the manner employed by wheelwrights in bending the felloes of wheels. For the construction of bent timber arches, it is preferable to employ only mechanical means, and to use the wood without any preliminary softening. **BENT TIMBER.**

G. R. H.

BENEDICTINE BUILDINGS. During several centuries the only laws of monastic life generally observed throughout western Europe were the regulations prescribed by S. Benedict, which were disseminated from Monte-Cassino with remarkable celerity by the followers of this rule, who may be said to have preserved and systematized the arts of agriculture and building throughout the dark ages. The council or synod held at Aix-la-Chapelle in 802 and 807 promulgated an explanation of this rule, and decided that it only should be followed in western Europe: it may be presumed, therefore, that most of the monasteries founded about that period, and much later, were built by Benedictine artists. At the beginning of the ninth century a Benedictine foundation was a model of a complete establishment. This is shown by the plan of the monastery of S. Gall in Switzerland, preserved among the archives of that suppressed institution, and probably drawn about the year 820: it is given in the *Journal of the ARCHEOLOGICAL INSTITUTE*, 8vo., London, 1848, v, 85, reduced from that published by KELLER at Zurich in 1844.

Before the thirteenth century, the order of S. Benedict had established or annexed nearly 16,000 *abbeys*; and the monks had attained such wealth, that there was considered to be occasion not only for the Cluniac and Cistercian reforms, in the tenth and eleventh centuries respectively, but for others. After the year 900, the order separated into various independent branches, such as the Camaldolese, Celestines, Gilbertines, Olivetines, Sylvestrines, and others, which, although not now

considered portions of the Benedictine order, only differ from it in some details of practice and dress. Most of the richest abbeys, and all the cathedral priories in England, except Carlisle, belonged to this order, the rule of which evidently received successive enlargements, consolidated by SS. Dunstan and Oswald, under king Edgar (959-975). This monarch so favoured the Benedictines, that the order is erroneously said to have been introduced into this country by S. Oswald, whose arrangements were preserved until 1077, when the English Benedictine monasteries were united by Lanfranc into a single congregation, which generally assembled at Northampton, and which adopted more severe customs as a slight reform in 1335. The abbots of Cluny preserved the Benedictine rule, but disallowed episcopal visitation or interference; coined money; governed three hundred and fourteen establishments; and built only priories or *obedientiae*, as they were called, similar to the *granges* or *villae* of the Cistercian order, which were complete monasteries of not more than thirteen monks, as fourteen could constitute a Cistercian abbey. The first reformation of the order was again reformed in 1621, and those Clunists, who did not adopt the new system, were called Old Clunians. The Benedictines had reached the culminating point of their architectural peculiarities at the beginning of the thirteenth century, when the art was taken up by the Dominicans and Franciscans; but some idea may be formed of the extent to which the customs of the Benedictines had prevailed, when it is stated that at the time of the Council of Basle (1433-1449) it was supposed that the order could enumerate 82,740 of its monasteries. The old or unreformed Benedictines, and the Cluniac monks, never ceased to give employment to those members of their body who could add the charms of art, luxury, or magnificence to their structures. Thus the church at Cluny has five aisles, and is the only one in France which has a double transept; like the church at Tournus, it has a strongly marked NARTHEX. CISTERCIAN BUILDINGS. 10.

The buildings of the Benedictine order are distinguished from those of the other orders by their richness of ornament in the interior, and by the pretentious character of their exterior. Throughout Germany and France, two western towers are frequently to be seen even to the smallest conventual churches of that order; and in this respect they differ in a marked manner from the Cistercian churches, in which severity of treatment inside and simplicity of outline outside are the characteristic features. Instances of this general rule might be cited without number in all parts of Europe, and the contrast is frequently strikingly exhibited in contemporaneous buildings of the same province and country. E. S.

MIRÆUS, *Op.*; HERMANT, *Hist. des Religions*, 12mo., Rouen, 1698; DACHERY, MABILLON, and RUINART, *Acta Sanctorum Ordinis S. B.*, fol., Paris, 1668 (this edition has plates peculiar to itself); REYNER, *Disceptatio de Antiquitate Ordinis B. in Angliâ*, fol., Duaci, 1626; YEPEZ, *Cronica General de la Orden*, fol., 1609; PHILOPONUS, *Novæ Typis*, etc. (America), 1621; FELIBIEN, *Histoire de l'Abbaye Royale de S. Denis*, fol., Paris, 1706; BOUILLART, *Histoire de l'Abbaye Royale de S. Germain-des-Prés*, fol., Paris, 1724; SCHOONEBEEK, *Hist. des Ordres*, 12mo., Amst., 1695.

BENESCH, BENESS, or BENNECH (BENEDICT), born at Laun near Saatz in Bohemia, in 1451, practised between the years 1502 and 1520 at Prague, where, in conjunction with Matthew Reyseck, he was engaged in directing the continuation of the Barbara kirche, and died there 29 September 1537, but was buried in the Stadt-pfarr-kirche of S. Nicolas at Laun. The palace built by him in 1502, for Ladislaus II of Bohemia, was burnt about forty years afterwards. Some perspective views have been engraved by Sadeler. 26. 92.

BENETIER, see STOUR.

BENEVENTO. A city in the delegation of the same name belonging to the Papal States, but situated in the middle of the province of Principato Ultra, in the kingdom of Naples. The

walls are about two miles in circuit, and have eight gates, one of which is the celebrated arch of Trajan, called Porta Aurea, erected in honour of that emperor by the senate A.D. 114, and now in better preservation than any other similar monument in Italy, except that at Ancona. It consists of a single archway 17 feet 4 inches wide, in a building of white (Parian?) marble with four Composite attached columns 21 feet 4 inches high, in front and in rear; the total height is 51 feet 10 inches, width 42 feet 8 inches, and depth 19 feet 8 inches: GAILHABAUD, *Monuments*, etc., 4to., Paris, 1850, i, 52. No town in Italy, except Rome, exhibits so many vestiges of antique art; many of the walls of the modern buildings are constructed with the fragments of the altars, tombs, and columns of Beneventum; while parts of the city walls, vestiges of a bridge, an amphitheatre called Li Grottoni, and other public buildings, still remain. The citadel, built outside the walls in the twelfth century, has since been used as the residence of the Papal delegate.

The Romanesque cathedral, dedicated to the Assumption, and sometimes called Gerusalemme, has five aisles formed by fifty-four fluted Ionic columns of white (Parian?) marble, four of grey granite, and two of verde antique marble. The central door is of bronze, and is said to have been cast and brought from Constantinople in 1150: but the style and the details warrant a doubt whether it was not made before 894, or at latest 934. In front of the cathedral is a small Egyptian obelisk of red granite, on which the name of Domitian occurs among the hieroglyphics of the inscription: and fragments of another remain in the archiepiscopal palace. Of the eight other churches, those dedicated to the Annunciation and to Sta. Sofia are the most interesting; the latter, an octagonal edifice, contains eight columns of oriental granite, and has a Romanesque cloister with forty-seven pillars. Besides the archbishop's palace, twelve monasteries, and two convents, the chief public buildings are the *palazzo pubblico*; the *seminario*, having a good library; four hospitals; and a stone bridge, built for Pius VI, by Vanvitelli. Of the university, only the edifice called the collegio dei PP. Gesuiti now remains. Rossi, *L'Arco Trajano*, 4to., Napoli, 1716; NOLLI, *L'Arco Trionfale*, fol., Rome, 1770; DE VITA, *Thesaurus Antiquitatum Beneventanarum*, fol., Rome, 1754; ROSSINI, *Archi Trionfali*, etc., Rome, 1836; BORGIA, *Memorie, etc., de Benevento*, 4to., Rome, 1763. W. H.

BENEZET (SAINT), improperly called S. Johannes Benedictus, is said to have arrived at Avignon in 1177, and to have there undertaken the construction over the Rhone of a bridge, of which one arch soon fell; but it was eventually completed in 1188. He died in 1184, and was buried on the third pier of the bridge from the city. A chapel was built over his remains, an hospital was erected, and a confraternity for the repair of the bridge was established, of which the first president seems to have been the Johannes Benedictus to whom the whole work has been ascribed. Great part of the bridge having been destroyed by an inundation, the body was removed in 1669 to the church of the Celestines at Avignon, but was restored to its original resting place in 1672. BOLLANDUS, *Acta Sanctorum*, April 14th, fol., Antwerp, 1643.

BENGAL. A light coloured wood of Canara, in the East Indies, used for building purposes; another variety is rather dark in colour. 71.

BEN HAMID (ABDERRAHMAN) is mentioned in an inscription dated A.D. 945, together with Abdallah BEN COLAIB. 66.

BENI ABBAS. A village about forty-five miles south of Tripoli, in Northern Africa, is remarkable for the manner in which the habitations are constructed. It is described by LYONS, *Narrative*, etc., 4to., London, 1821, pp. 25-29, in the following terms: "A person unacquainted with the circumstance might cross the mountain without once suspecting that it was inhabited. All the dwelling places being formed in the same manner, a description of the sheikh's may serve for the rest. The upper soil is sandy earth of about four feet in depth; under this sand, and in some places limestone,

a large hole is dug, to the depth of twenty-five or thirty feet, and its breadth in every direction is about the same, being as nearly as can be made a perfect square. The rock is then smoothed so as to form perpendicular sides to this space, in which doors are cut through, and arched chambers excavated, so as to receive their light from the doors. These rooms are sometimes three or four of a side, in others a whole side composes one; the arrangement depending upon the number of inhabitants. In the open court is generally a well, water being found at about ten or twelve feet below the base of the square. The entrance to the house is at about thirty-six yards from the pit, and opens above ground. It is arched overhead, is generally cut in a winding direction, and is perfectly dark. Some of these passages are sufficiently large to admit a loaded camel. The entrance has a strong wall built over it, something resembling an ice-house. This is covered overhead, and has a very strong heavy door, which is shut at night, or in cases of danger. At about ten yards from the bottom is another door, equally strong, so that it is almost impossible to enter these houses should the inhabitants determine to resist. All the sheep and poultry are confined in the house at night. There are many Jews living in these mountains, whose dwellings are much cleaner and better excavated than those of the Arabs, and are also neatly whitewashed." At about six miles further south, the same author arrived at another cluster of these dwellings, or *nests* as he terms them, which is called El Guasem, where he found a sort of tower above ground. "The turret itself is constructed in a mode common to many others in these mountains. At about half way down one of the subterranean passages, a hole is cut upwards in an awkward way through the rock, into the first floor of the turret, which is even with the ground and perfectly dark. From this floor is an ascent to one, two, or three stories, by means of pieces of stick placed in the walls. Each floor consists of branches of trees, most alarmingly elastic; and the door of entrance from one to the other is a small hole, through which a person has to force himself upwards."

BEN IBRAHIM EL OMAIEH (FATRO), also known as ABEN EL CAXERI of Toledo, is mentioned by CONDE, *Historia de la Dominación*, 4to., Madrid, 1820, i, 506, as the architect, much renowned for his acquirements and travels in the East, who constructed about the year 983 the mosques called Gebal Berida and Adabégín at Toledo, and had afterwards the charge of restoring the walls and fortifications of Maqueda and Wakes.

BENI HASSAN. A village in the province of Minieh in Central Egypt. It is celebrated for more than thirty groups of chambers, which are considered to be amongst the finest and most interesting specimens in that country of excavations for sepulchral purposes. All these excavations are situated about two miles to the north of the present village, and are presumed to be portions of the necropolis of a city called Nus in the inscriptions, which seems to have been situated on the other side of the river. They are cut in the calcareous rock (*numismale*) that forms the side of the hills overhanging the eastern bank of the valley of the Nile, and the principal ones are approached by broad roads, formed by rows of large stones, up the slope of the hill from the gravelly bank of the river. The style of the paintings which cover the walls, and of the hieroglyphic inscriptions accompanying them, would prove the high antiquity of this necropolis, even if the exact epoch were not found noted by the names of Osirtesen I, the predecessor of the chief of the eighteenth dynasty; and by the date of the forty-third year of the reign of that king, which is placed in the eighteenth century B.C. by WILKINSON, in the seventeenth by SHARPE, in the twentieth by ROSELLINI, and in the twenty-ninth by LE SUEUR.

The most important chambers are those found in the northern portion of the range, and containing examples of the pillars which have occasioned so much question respecting the Egyptian origin of a Proto-Doric order. Much uncertainty prevails

as to the details of the peculiarities observable in this locality; thus statements vary as to the number of sides in the polygonal plans of the pillars; also as to which sides are fluted, and which are left plain, probably for the insertion of hieroglyphics. Sir C. BARRY, in his contribution to the introductory essay in Gwilt's edition of Sir W. Chambers' work, p. 37 note, mentions external columns with twenty shallow flutes; and WATHEM also calculated twenty flutes; while most authors mention only octagon external columns. It must be presumed that the difference in the reports is caused by the choice made of a different tomb for each survey. The *Description de l'Egypte* (Antiquities), p. 49, pl. iv, 64, text, iv, 334; ROSELLINI, *Mon. Civ. Atlas*, ii, 3; LEPSIUS, in *Annali dell' Instituto*, Rome, 1837, pl. 45, p. 65; GAILHABAUD, *Monumens*, i, 19; WILKINSON, *Architecture of Ancient Egypt*, London, 1850, pl. 3, p. 35, have not rendered superfluous some future topography, with geometric illustrations, and a clearly detailed account of the chambers. The following description of the general appearance of each group indicates some of the features which require an authoritative notice from some future travelling architect.

A dromos or avenue leads to a court; the walls, which are partly destroyed, were probably as high as the portico which they precede. This portico is raised a step higher than the court, and is formed by two polygonal pillars, standing on large bases very slightly raised and chamfered. The shafts, which have a slight diminution towards the top, are each surmounted by a simple abacus of a square form, whose width is equal to the lower diameter of the column, and which consequently projects beyond the upper periphery as much as the column is diminished. The architrave rests upon the abacus, both being in the same line of face, and without any architectural division. The fascia above this architrave projects as far as the step which separates the court from the portico. The line of cantilevers or modillions, rounded at bottom, and placed at equal intervals beneath it, is peculiar. The upper part of the cornice, if any ever existed, is too much decayed to show the original form. The ceiling of the portico is segmental in section, and is placed transversely to the axis of the excavation, on one side on the architrave of the columns, and on the other on the wall which separates the portico from the principal chamber. This room, which is raised by a second step of about 6½ inches in height, like the first, and entered through a doorway which is 6 feet wide, contains columns in two rows, supporting a ceiling of three vaults formed like that of the portico, but placed in the line of the axis. The southern tombs differ in their architraves having pedimental faces formed by the rake of the sloping ceilings, and in their columns being of the kind which is supposed to represent four large reeds of the Nile bound together by cords near their tops, which form the capital. All the tombs are decorated with coloured patterns, among which are ornaments perfectly similar to that which is commonly called the Greek fret: and the columns and the lower parts of the walls are stained of a red colour to imitate granite.

About a mile south-east of the present village is a small temple commenced by Thothmos III, and continued by Osirei, the father of Ramses the Great. It consisted of a portico with two rows of square pillars, four in each row; and a naos in the back wall of which there was a further recess about 8 feet above the floor. The columns in the naos are of the kind supposed to represent four large reeds. This temple, now called *Stabl Antar*, was dedicated to Pasht, the Egyptian Diana, and is therefore supposed to be the ancient *Speos Artemidos*; but HAMILTON, *Egyptiaca*, noticing a large natural cave in the steep sides of a watercourse, will not allow that the term *speos* was applied to an artificial excavation.

BENINCASA (GIOVANNI), with Ferrante Maglione, de-

signed and built the palazzo Reale, now the palazzo Vecchio, and many churches and mansions in Naples. They died about the year 1580. 36.

BEN KLAIB BEN THABITA, see BEN COLAIB (ABDALLAH).

BEN MEUHAZIN or MOUHASSEN (GIAFAR) is mentioned in an inscription dated in A.D. 835, together with Abdallah BEN COLAIB. 66.

BEN MUHAMAD ALAMERI (EL WASIR CHALAF) built the bridge at Toledo in A.D. 997, according to CONDÉ, *Dominación*, 4to., Madrid, 1820, i, 539.

BEN MUHAMAD BEN SOMEID (EL AMIL OMEYA) constructed the reservoir of the aqueduct at Ecija in Spain, A.D. 950, according to CONDÉ, *Dominación*, 4to., Madrid, 1820, i, 422.

BENNET (SIR ROBERT) is mentioned as surveyor of the works at Windsor Castle in 1637, by POYNTER, *Essay* prefixed to *Illustrations of Windsor Castle*, fol., London, 1841.

BENOIST (. . . .) was admitted a member of the Academy of Architecture at Paris in 1728, and died in 1734. 45.

BENONI (GIUSEPPE) was a pupil of Baldassare Longhena. CICOGNARA, *Fabbriche*, fol., Venice, 1838, i, 89, pl. 73, attributes to him the church of S. Basso, burnt in 1670; and ii, 93, pl. 217, about the year 1682, the fine loggia and tower of the *dogana da mare* or custom house, both at Venice: the commission was obtained by him in competition against Longhena, Cominelli, and Sardi, in May 1677. Part of the raking flanks had been executed by Longhena. The building was finished in 1835 by Pigazzi.

BEN SAID BEN MUHAMAD BEN BATRI (ABDALLAH), *sahib zarta* (chief of the police) at Cordova, superintended, about A.D. 981, the construction of the magnificent mosque of the sultana mother, and thence called the mezquita Sobeyha, but more commonly the mosque of the mother of Hisém. He was also entrusted, by order of the Hagib Muhammad Almanzor, with the superintendence of the restorations then proceeding at the great mosque, the "Aljama", in the same city. CONDÉ, *Historia de la Dominación*, 4to., Madrid, 1820, i, 504. BATISSIER, *Histoire de l'Art*, 4to., Paris, 1845, p. 422, makes the date A.D. 994, and calls him simply Abdallah ben Said, adding that this architect was probably commissioned to execute the important additions made to the last named mosque A.D. 998. GIRAUT DE PRANGEY, *Essai*, 8vo., Paris, 1841, gives Abdallah ben Said as the name, and A.D. 981 as the date. He died in 1010.

BENSO (GIULIO), born soon after 1600, at Pieve del Tecco near Genoa, was a pupil of Giambattista Paggi, and enjoyed considerable reputation on the continent as a painter as well as an architect. His most important work in the latter capacity was the monastery and church of the Augustine nuns in his native place, where he died in October 1668. 37.

BENSON (WILLIAM), son of Sir William Benson, who had been sheriff of London, was born in 1682, received a good education finished by a continental tour which included Hanover and Stockholm, was appointed high sheriff of Wiltshire in 1710, and sat as representative of Shrewsbury in the first parliament of king George I, but resigned on being appointed surveyor-general in 1718, as successor to Sir Christopher Wren. Apparently in virtue of this office he was enabled to erect the balustrade over the upper external order of the body of S. Paul's cathedral, in opposition to the opinion of Wren. Having been directed to survey the House of Lords, he reported that room and the Painted Chamber adjoining to be in danger of falling; "on this the Lords were about to appoint some other place for their meetings, when it was suggested that it would be proper to take the opinion of some other builders, who reported that the building was in very good condition". Benson was removed, but he obtained the assignment of a considerable debt due to the Crown in Ireland, and the reversion of the office of auditor of the imprests, which he enjoyed after the death of

Mr. Edward Harley. His fitness for the appointment of surveyor-general must have been presumed from Willbery, near Amesbury in Wiltshire, given by CAMPBELL, *Vit. Brit.*, fol., London, 1715, pl. 51, 52, as "the seat of William Benson, Esq., invented and built by himself, in the style of Inigo Jones, who by this excellent choice discovers the politeness of his taste: and as he is master of the most refined parts of literature, has here expressed a particular regard to the noblest manner of architecture in this beautiful and regular design, which was executed anno 1710". His literary character and works, attacked in the third and fourth books of the *Dunciad*, were defended by WARTON, in the notes to the fifth volume of that author's edition of the works of Pope. He died at his residence at Wimbledon in Surrey, 2 February 1754. NICHOLS, *Literary Anecdotes*, 8vo., London, 1812.

BENT TIMBER. The purposes to which wood in a bent state, are applied, are principally those which require the use of thin slabs, as in joiners' work; or, to quote a more modern application, laminated arcs, either for roofing or bridge building. The object to be attained in either case is the formation, artificially, of a solid piece of timber of the shape of the arc or curve, and which shall have the smallest possible horizontal thrust at the feet. In joiners' work the slabs are made thinner in the direct ratio of the smallness of the radius, and in carpentry the same rule ordinarily prevails; but in modern works it has not been rigorously applied, for arcuated ribs of great span have been formed entirely of thin planks of equal thickness. About the commencement of the present century, in fact, several bridges were erected in France and Germany with curved ribs, formed of whole balks of timber; but great difficulty was found in bringing the beams to the required curvature, and it often became necessary to steam them, or to bend them by heat, a process which was supposed to affect the durability of the wood. M. de St. Far of Strasbourg, therefore, proposed about 1811 to use thin planks for the purpose instead of whole balks; but it was not until the year 1819 that Colonel Emy, of the Génie Militaire, succeeded in establishing the use of this kind of curved rib, by constructing the roofs of the riding schools of Marac and Libourne. Subsequently numerous bridges have been erected with beams of this description, both in England and upon the continent.

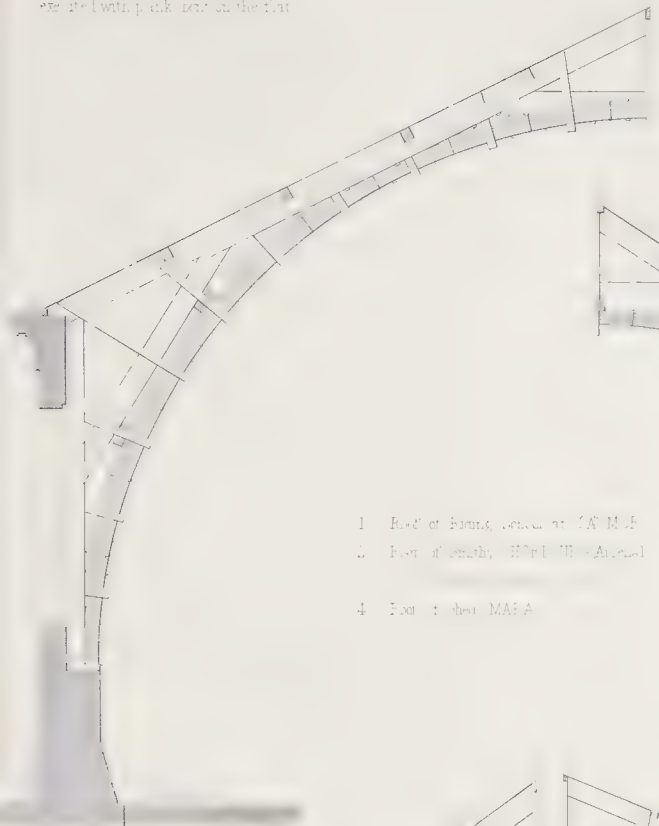
Colonel Emy tried some experiments to ascertain the amount of horizontal thrust at the feet of the ribs he employed in the above cited buildings, and he was induced to consider it to be, substantially, so small as not to require notice. The beams, of about 70 feet span, were formed of planks, maintained to their curve by iron straps placed every 5 feet apart, and by bolts in the intermediate spaces about 1 foot distant from one another; and in these experiments it was found that the arcs deflected at the haunches more easily than they moved at the feet. In the year 1831 NAVIER, however, inserted a remarkable memoir in *Les Annales des Ponts et Chaussées*, in which he demonstrated that "even on the supposition that the bent timber ribs became single and homogeneous pieces, they must exercise a thrust in a horizontal direction at their points of support." In the year 1840, Colonel ARDANT, of the Génie Militaire, published the results of some experiments he had been commissioned to make on large timber roofs, at the expense of the Ministry of War, which appear to have decided the various theoretical points connected with this system of construction till then involved in uncertainty. The reader is referred for further information upon this subject to EMY, *Traité de l'Art de la Charpente*, 4to., Paris, 1841; and ARDANT, *Etudes sur l'établissement des Charpentes à Grande Portée*, 4to., Metz, 1840. The latter contains all the formulæ requisite to calculate the dimensions of timber arcs of any span, rise, or transverse section; but these can also be found more readily in CLAUDEL, *Formules, Tables, et Renseignements pratiques*, 8vo., Paris, 1854.

In the various bridges and large roofs lately executed with

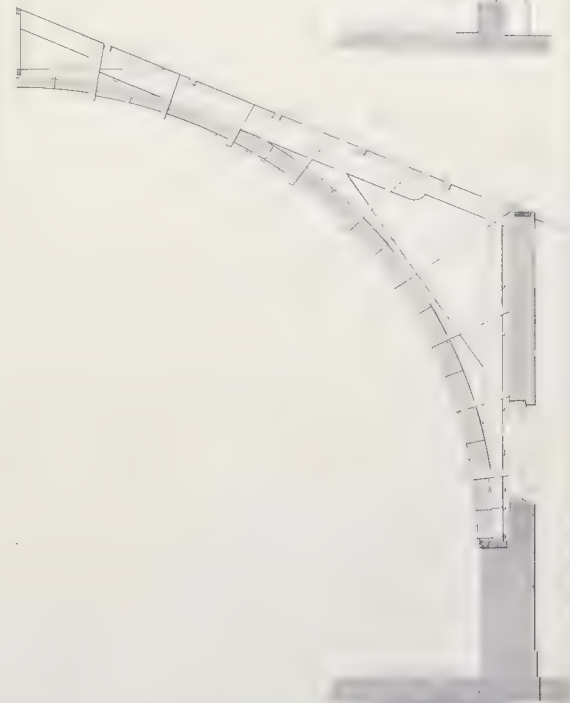
BENT TIMBER

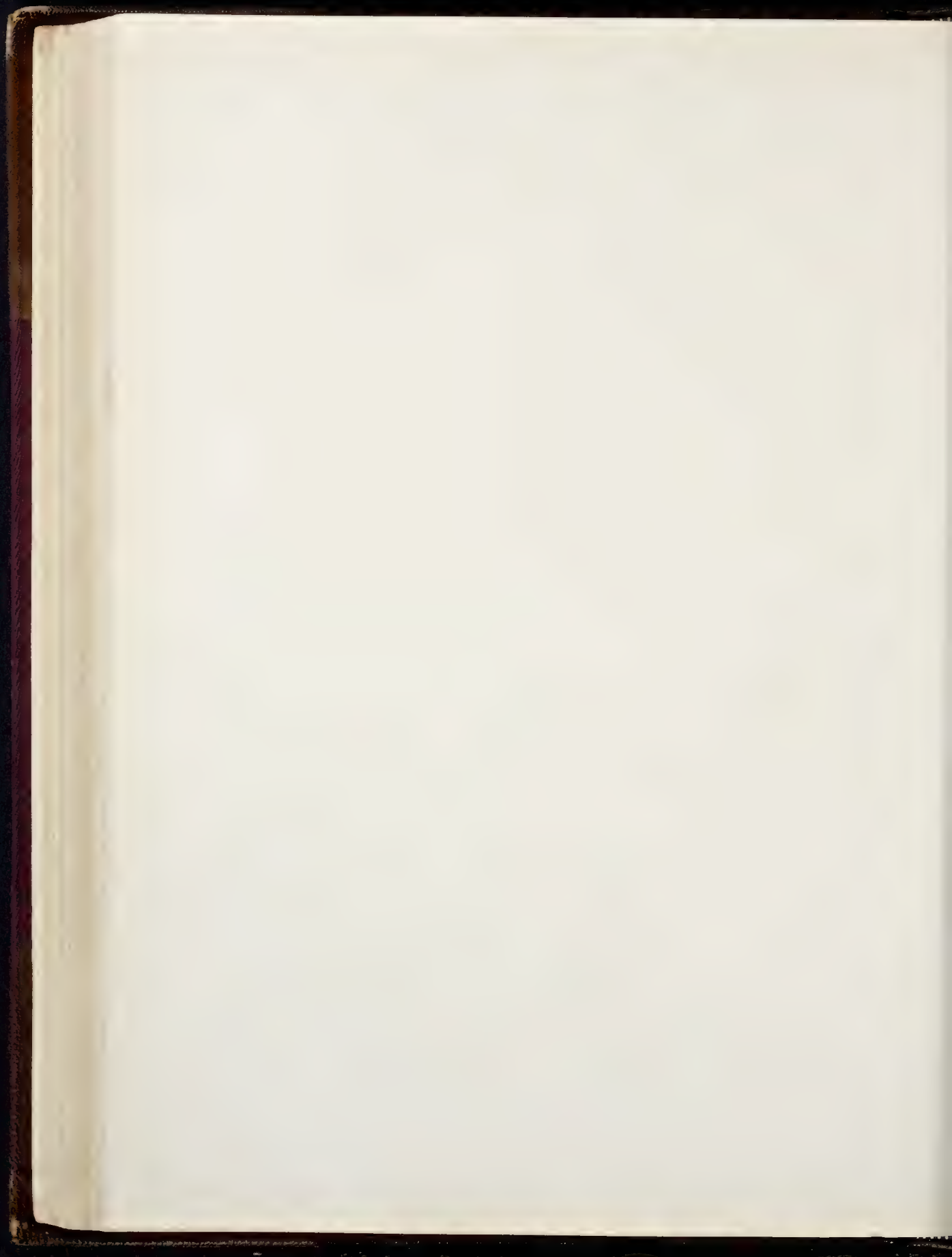
Section of Bent Timber
 showing the joint at the top
 and the joint at the base

Extract from APDANT'S



1. Joint at top, section at 1/4 M.F.
2. Joint at top, section at 1/2 M.F.
3. Joint at top, section at 3/4 M.F.
4. Joint at base, section at 1/4 M.F.





ribs of bent planks, the thickness given to the latter ranges from 1½ inches to 3 inches, and the respective layers are in the best examples securely fixed to those immediately below them by trenails, or by iron nails. That this is an important part of the process of forming such beams must be evident, from the consideration that, in the first place, it tends to prevent the planks from slipping over one another; and, in the second, that the upper layers cannot resume the horizontal line, if they be firmly attached to the lower ones, without elongating the fibres of the latter to an extent equal to the difference of their respective developments. It is found in practice that the planks bend with the greater ease in proportion as they are fresh and free from knots; the wood from floated balk timber is, in fact, preferable for such use to that known as prepared deal or plank. Great attention was paid, in the erection of several railway bridges lately executed in France, to saturating the planks with sulphate of copper, to covering both their upper and under surfaces of contact with tar, and to inserting sheets of brown paper soaked in tar between the layers. The uppermost course was made to project, and to carry a deep throating, so as to throw off the water; whilst the exposed surfaces were carefully painted. Yet within a very few years from their completion, these bridges exhibited marked symptoms of decay; and the result of the application of the system to this class of constructions has shown that wherever planked ribs are exposed to variable weights, which cause the joints to open, moisture will be introduced to the interior, and decay will inevitably ensue. For roofing purposes, there does not appear, however, to exist any danger of this description, and curved ribs of bent plank may often be applied with success, where tie-beams cannot conveniently be introduced.

In the second volume of the *PROFESSIONAL PAPERS OF THE CORPS OF ROYAL ENGINEERS*, p. 139, Lieut. NELSON gave a short description of the mode adopted in Prussia for bending large balks of timber, which might be applied with advantage in some cases, especially in the execution of open timbered Gothic roofs. It consists principally in running from three to five saw kerfs through the wider portion of the balk, without carrying them entirely to the smaller end; so that, in fact, the beam becomes a mixed beam, one end of which is of solid timber, and the other of bent planks, retained to their curvature by keys, straps, or bolts. Local circumstances must always guide the architect in the choice of the system he should adopt; but it may perhaps always be objected to the Prussian system that it does not offer the same facility for ensuring the soundness of the heart of the beam which exists when planks are used; and the depth, or other dimensions, must be limited by the size of the timber furnished by the particular district.

Amongst the important constructions in which bent timber beams have been used, formed of planks as treated by Col. Emy, may be cited the bridge at Willington Dean, on the Newcastle and Tynemouth railway, the largest arch of which has a clear opening of 128 feet, and a versed sine of 36 feet; that over the Seine on the Paris and Rouen railway, of 100 feet span and 14 feet 5 inches versed sine; that over the Seine at Eauplet, of 133 feet span and 19 feet 8 inches versed sine; the Dinting Valley viaduct, with arches of 125 feet span and 25 feet versed sine; the roofs over the riding school already mentioned; those of the Great Northern Railway Station, London, of the nave and transepts of the Crystal Palace, etc., etc. C. R. B.

BEN YOUNAS (ABDALLAH), sometimes called Muslimatu ben Abdallah ben Younas, is described by MURPHY, *Arabian Antiquities*, fol., London, 1815, p. 169, as the chief builder and chief geometician (that is, architect) who designed and built, in A.D. 937, the alcazar of Abderrahman III, at Zahra or AZAHRA in Spain, a town of which even the ruins have disappeared. The palace, with its 4,312 columns of precious marble, is mentioned at length by MURPHY, as above, and by GIRAULT DE PRANGEY, *Essai*, 8vo., Paris, 1841, p. 53, who states that the

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destruction of this building was commenced in 1008; whereas CONDÉ, *Historia de la Dominacion*, 4to., Madrid, 1820, i, 611; ii, 39, 43, mentions it under the years 1022 and 1061.

BERCKMAN, see BERGMAN.

BERCKMANS (FERDINAND), son of the cabinet-maker John Francis, was born 3 August 1803, and was a pupil of Adam Erkens, and afterwards of Roelandt and Bourla. His principal works are the Gothic churches of Borgerhout near ANTWERP (1841-46), illustrated in the *BUILDER Journal*, xii, 239, and of Brasschaet; the Gothic *Gemeentehuis* (rath haus) at Duffel; a mansion (*casteel*) at Deurne; the Gothic tower at Grobbendonck; and the new chapel of the Sacré Cœur in the cathedral at Antwerp. He became architect to the last-named city, and professor in the Academy there; and died early in October 1854. His pupils were F. Durlott, P. P. Stoop, J. Schadde, P. Dens, and E. Gife.

BERE or BEERE (RICHARD), abbot of Glastonbury, built the new lodging by the great chamber, called the King's Lodging, in the gallery; the new lodgings for secular priests and clerks of our Lady; part of Edgar's chapel, at the east end of the church; and the arches on both sides of the east part of the church that began to cast out, the vault of the steeple in the transepts, and under two arches like S. Andrew's cross, else it had fallen. Bere, coming from his embassy out of Italy, made a chapel of our Lady of Loreto, joining to the north side of the body of the church; the chapel of the Sepulchre in the south end of the nave of the church, whereby he is buried, *sub plano marmore*, in the south aisle of the bodies of the church; an almshouse in the north part of the abbey for seven or ten poor women, with a chapel; and also the Manor Place at Sharpham, in the park two miles west from Glastonbury; it was before a poor lodge. *LELAND, Itinerary*, 8vo., Oxon., 1710, iii, 85. He died 20 January 1524.

BERE STONE or BEER STONE. This stone, which is often mentioned in the earlier architectural records, is noticed in the *Report, etc., of the Commission to inquire into the qualifications, etc., of Stone for Building Purposes, more particularly for the new Houses of Parliament*, 2nd edit., 4to., 1845, as composed chiefly of carbonate of lime, friable, and with partial indurations. It is extensively quarried at the village of Bere, or Beer, on the south coast of Devon, near Axminster. Geologically speaking it belongs to the cretaceous series. It is a limestone not essentially different from the well known product of the Maestricht quarries, and is obtained in the same manner, namely, by underground excavations and adits, like mines of metallic ore. Many ecclesiastical buildings attest the early use of this stone. It was largely employed for the tracery and finer work of Exeter cathedral, which have been lately restored in the same material; and the published fabric rolls of S. Stephens, Westminster, shew that it was there employed with the Merstham or Reigate stone, which it closely resembles. The chalky stone of the old abbeys and churches in and near Rouen belongs to the same series. S. S.

BERENDS (HEINRICH) of Hanover, erected, in 1514-16, the Petri-thurm at Hamburg. 92.

BERENICE TROGLODYTICA. A city on the Sinus Immundus, or Foul Bay, in the Red Sea, raised out of a village by Ptolemy II Philadelphus. It is now in ruins, and only remarkable for a temple to Serapis, which is built of sandstone and a soft calcareous stone, and is about 100 feet long and 40 feet wide: it has a staircase with three inner and as many outer chambers, and contains inscriptions exhibiting the names of Tiberius and of Trajan. 28.

BERETTA (LUDOVICO), designed the façade of the church (commenced about 1480) of Santa Maria dei Miracoli at Brescia, which is supposed to have been executed from about 1520 to 1530. This façade is one of the most remarkable in Italy as a monument of the florid cinquecento arabesque; but though so great a work, the historians of Brescia have not yet succeeded in discovering the artists of the sculptures, casts of which are

to be seen in the museum of the School of Practical Art. *Catalogue of Casts*, etc., 8vo., London, 1854, p. 26.

BERGAMA, in Asia Minor. The modern name for PERGAMOS.

BERGAMASCO (IL), see BERGAMO (GIAMBATTISTA DI), and (GUGLIELMO DI).

BERGAMO (the ancient BERGOMUM), the capital of the province of the same name in Austrian Italy. The town is now composed of two separate portions, the *borgo di S. Leonardo*, at the foot of a hill, and the *città*, which is about half a mile higher up. The old city was well fortified in the 16th century, and is one of the best representatives in Italy of a mediæval town; the old and wealthy families to whom the neighbourhood has belonged for centuries still dwell in solid and lofty houses, the open entrances of which, exhibiting *cortili*, with pointed arches resting on massive columns, occur at frequent intervals in the narrow streets and still narrower lanes, the sides of which are often connected by arches, casting refreshing and picturesque shadows. There were two cathedrals: one was first dedicated to Sta. Agnese, then to S. Vincenzo, and afterwards to S. Alessandro on the removal of his ashes about 1561, in which year the Venetians destroyed the other cathedral dedicated to S. Alessandro. The existing *duomo*, with its fine cupola, was begun by Antonio Averlino, called Filarete, but being considered too small, the construction of it was suspended after some time, but was completed by Carlo Fontana.

The church of Sta. Maria Maggiore, called a basilica, built by Il Maestro Fedro in 1134 (HOPE, *Essay*, 8vo., London, 1840, p. 272), is remarkable for its campanile, more than 300 feet in height; its green and black marble pulpits, with handsome iron staircase railings on each side of the entrance to the choir; its two magnificent tombs; its semicircular Romanesque apse with a gallery round the cornice, and its rich south porch belonging to the same style, with cabled and other shafts resting upon lions grouped with their cubs and with children, and surmounted by a kind of shrine in a pointed style. This canopy was added by Giovanni da Campello, who built the north porch of the edifice in 1360, while the octagonal sacristy ("of a singular bastard pointed manner", HOPE), which was erected according to the existing inscription in 1430, is one of the first dated examples of the Renaissance style in Italy. A view of the southern portal and the accompanying façade of the Colleone chapel, which is a remarkable example of Renaissance work, is given by SOMMERARD, *Moyen Age*, series 2, pl. 13. The *piazza* which leads from the town-hall by a pointed arcade to this church and the cathedral, is one of the most picturesque in Northern Italy; even the fountain in its centre, having lions placed alternately with serpents entwined upon a tree, is curious; the *broglio* or *palazzo pubblico*, one of the four town-halls of Italy which specially deserve to be studied, is a Gothic building on an arcaded basement, with a *ringhiera* or balcony for the magistrates and an open external staircase; it is now converted into a public library; the *palazzo nuovo* begun by Scamozzi, is incomplete.

The public establishments of Bergamo consist of about fourteen other churches, twelve monasteries and ten convents with their churches; ten hospitals, one of which is called "vast"; a public *lyceo*, an ecclesiastical *seminario*, an *ateneo*, and a large museum, library, and gallery of inferior pictures, under the charge of an academy of the Fine Arts. Architectural works are chiefly seen in the churches respectively dedicated to S. Alessandro della Croce, S. Andrea, S. Bartolommeo, S. Erasmo, Sta. Grata, S. Lazaro, Sta. Maria delle Grazie, S. Rocco, and S. Alessandro in Colonna, a building of the fifteenth century, which has a fine cupola of later date: and in the palazzi Moroni, Mossoli, Sozzo, Terzi, and Vaglietti, and the theatre. The library of the PP. Franciscani was designed by Count Alessandro Pompei. BARTOLI, *Le Pitture*, etc., di B., 12mo., Vicenza, 1774. LUPI, *Codex Diplomaticus Eccles. B.*, fol., Bergamo, 1784.

26. 28.

The church of S. Agostino, outside the town, has a tall pointed window of great elegance on each side of the door (HOPE): and about eight miles north of the city is the very interesting round church of S. Tommaso in limine, with a domical centre roof concealed externally by a tambour and roof carrying a lantern; the projecting chancel is square, with a semicircular apse. This building is attributed to the Lombards of the seventh century by GALLY KNIGHT, *Ecclesiastical Architecture*, fol., London, 1842, i, 17, who gives a plan, elevation, and section of it, wherein the bases of the lower columns appear remarkable.

BERGAMO (BARTOLOMEO DA BUONO DA), see BUONO (BARTOLOMEO DA).

BERGAMO (COSMO DA), was the architect from whose designs the church of S. Lorenzo in Lucina at Rome, said to have been founded by Sixtus IV in the beginning of the fifth century, was restored in 1606 under Paul V, who created him a cavaliere.

28.

BERGAMO (GIAMBATTISTA DI), called IL BERGAMASCO, see CASTELLO (GIAMBATTISTA DI).

BERGAMO (GUGLIELMO DI), also called IL BERGAMASCO, is supposed to have built the *palazzo dei Camerlenghi*, finished in 1525, CICOGNARA, *Fabbriche*, fol., Venice, 1838, i, 99, pl. 87-89, and the hexagonal *capella Emiliana*, twenty feet in diameter, finished about 1530, close to the Camaldolese church of S. Michele in Murano, ii, 127, pl. 253-256: the same author attributes to him the shorter side, towards the church of S. Mark, of the interior of the great *cortile* to the ducal palace, i, 64, pl. 31: and also to him or else to one of the Lombardi, the *palazzo Trevisano* sul Rivo della Canonica (i, 90, pl. 74), all at Venice. The same author insists that this artist was not employed upon the *Procuratie vecchie* in that city. Other writers ascribe the *palazzo Tasca* at Portogruaro, near Friuli; the *portello* or great gate at Padua, and the porta di S. Tommaso at Treviso, to Il Bergamasco.

3. 82.

BERGAMO MARBLE. A black marble, of the finest texture and the most even colour, quarried near Bergamo, which, if not the real NERO ANTICO, as is generally supposed, is at least equal to it. It is called by the Italians PARAGONE, from the excellence of its tint and the fineness of the polish which can be given to it.

W. H.

BERGEBORD, sometimes improperly written for BARGEBOARD.

BERGMAN (JACOB), born at the Hague about the year 1730, was placed as a pupil with Peter Swart and with F. L. Gunckel, with whom he afterwards became a partner, and built some of the finest houses at the Hague. Being a clever sculptor, he devoted extreme attention to the decorative portion of the works. The splendid mansion called Haag Zicht, in the vicinity of the Hague, demolished a few years after its erection, was perhaps the finest of the works executed by Bergman alone. He died unmarried at the Hague in 1795. The plan and view of the château called Brockhuysen, near Amerongen, in the province of Utrecht (afterwards enlarged by Ziesenis), given by GOETGHEBUER, *Délices des Pays Bas*, fol., 1827, pl. 61, 62, probably represent a work by this architect. Johan Nieuwenhuizen was one of his pupils.

24.

BERHAM (HELYAS DE), canon of Salisbury, is reputed to have been the designer of the cathedral church in that city, on account of the following passage from a manuscript belonging to the church, "A primo fundatione rector fuit nove fabricæ per viginquinque annos", quoted by LELAND, *Itinerary*, 8vo., Oxford, 1744, iii, 80. Some writers wish to make it appear that this Helyas and Elias de London were identical; but the probability of this notion depends very much on the meaning of the words *nove fabricæ*. The first stone of the church was laid in 1220, and Elias de Deram (Beram?), supposed to be the same person, is mentioned under the date 1225 by BRITTON, *History*, etc., of Salisbury, folio, London, 1815, p. 25.

BERLIN. The capital of the kingdom of Prussia, and, after Vienna, the largest town in Germany. For the beauty and size of its buildings, the regularity of its streets, and the importance of its institutions of science and art, it is one of the first cities in Europe. The drainage is very bad in consequence of the city being situated on a level sandy plain on both sides of the river Spree, which is here about two hundred feet broad, crossed by about forty-two unimportant bridges variously decorated, and winds through the city, forming an island near the centre by the division of its channel. A wall sixteen feet high, containing sixteen gates besides minor outlets, surrounds the city, which is divided into eleven sections or quarters, of which "Berlin proper" contains the principal public buildings. The old portion, situated on the right bank of the Spree, is very irregularly built, and consists for the most part of narrow crooked streets and very indifferent houses. The oldest façade now existing is the water-side front of the Schloss, erected in the sixteenth century; all the other buildings of any architectural importance having been erected since 1700.

The modern portion of the city, commenced by Frederick the Great, has long, straight and spacious streets at right angles with each other, well paved with granite slabs, lighted with gas, and lined with houses of uniform appearance, of two or more stories in height, which are built partly of white freestone and of brick plastered. A specimen, being a house in Leipzig Street from the designs of Stüler, is given in the *BAUZEITUNG* for 1842-5, pl. 519, and in the *ARCHITECT Journal*, ii, 298; see also pl. 56, 61, etc., in SCHINKEL, *Sammlung*, etc. The principal and most frequented street, the *Unter-den-Linden*, is perhaps unsurpassed. It is 3,000 feet in length and 168 feet in width, and is occupied by a double avenue of lime trees, with a broad path in the centre, carriage ways on either side, and a spacious foot pavement beyond. It contains the bronze equestrian statue, 16 feet 3 inches high, of Frederick the Great, by Rauch, erected 31 May 1851, and said to have cost about £120,000; the total height is 43 feet; *ILLUST. LOND. NEWS*, xviii, 543; a bronze statue 26 feet high to Blücher, in 1826, is by Rauch, who also executed the statues of the generals Scharnhorst and Bülow, in Carrara marble, 18 feet high. The principal public buildings are at the east end, the Brandenburg gate being situated in the *Pariser platz* at the western extremity: the design of this gate is adapted from the propylæa at Athens; it was constructed (1789-1793) by Langhans, and is 195 feet 9 inches wide by 80 feet high, including the Victory, by Schadow, which is 16 feet. The six larger columns on each front are of the Doric order, 5 feet 8 inches diameter and 44 feet high, with five entrances between them, the centre one being 18 feet and the others 12 feet 4 inches wide; the eighteen side columns are each 3 feet diameter and 24 feet high. The "New" (city) gate near the *Charité* hospital, erected in 1836 by Schinkel, is given in the *Sammlung*, etc., pl. 155-6. The Potsdam gate, of the Doric order, is also by Schinkel (*Sammlung*, pl. 23 and 24).

The *plätze* or squares are numerous, and some of them are of large size; those called *Pariser*, *Leipziger* (of an octagonal form), and *Belle Alliance*, with its bronze statue of Victory by Rauch, are among the best; but the finest is the *Wilhelmsplatz*, with the statues in Carrara marble to the generals of Frederick the Great by Schadow, Adam, and Tessaert, about 1770-80.

The religious edifices, consisting of about forty-two places of worship and two synagogues, are not remarkable for interior ornamentation. The principal are the *dom-kirche*, or cathedral church, rebuilt by Boumann, Sen., 1747-50, with a portico of two Ionic columns but altered by Schinkel in 1817; it is 337 feet long by 136 feet wide, and contains the tombs of the royal family. The church of S. Nicholas, the oldest in Berlin, was consecrated about 1223; the altar end was rebuilt in 1379; the great altar, after a model by the painter Gericke, was erected 1715; and the edifice was restored by Langhans in 1817; it is 179 feet long by 73 feet in width and 40 feet high. S. Mary's church, the finest

in Berlin, was erected towards the end of the thirteenth century; the tower was rebuilt by Smids, 1663-6, 272 feet in height, an addition by Langhans in 1790 increased it to 292 feet. The church is 211 feet long by 99 feet wide and 56 feet high, with a good pulpit of alabaster, by Schlüter, and a bronze font of 1437. The high altar was erected 1757-62; and the interior has been restored by Schinkel. The *Kloster kirche* erected about 1300, was last restored and a Gothic entrance erected by Quast in 1844; it is 166 feet long by 66 feet wide; the nave is 50 feet, and the side aisles 26 feet high. The Garrison church in Spandau strasse, the largest in Berlin, was consecrated 1722; it contains nearly 16,000 superficial feet independent of the columns. The Parochial church, built in the form of a cross, 51 feet by 102 feet, was commenced in 1695 by Nehring, who was succeeded by Grunberg; and Gerlach completed the building in 1707-15. The Roman Catholic church of S. Hedwig was built 1746-1773; the dome, raised on twenty-four Corinthian columns, was erected by Boumann, Jun.; the remainder by Büding and Le Gay is in imitation of the Pantheon at Rome. The rotunda adjoining, used as vestry-room, etc., was erected in 1778. The handsome façade has a portico of six Ionic columns placed on a flight of steps. The *Werder'sche* church erected after a design by Schinkel in 1825-8, is in a pseudo-Gothic style, of brick, stucco, and cast iron; it is 189 feet long and 51 feet wide; a Greco-Italian design for the same church is given in *Sammlung*, etc., pl. 49 to 52, and that erected in pl. 79 to 84. The French church in the Gens d'Armes platz, erected after that at Charenton pulled down in 1685, was begun by Captain Gontard, but the work was transferred to Unger in 1781; the tower, 225 feet high, was built 1780-85; the dome is 55 feet diameter; three Corinthian porticos of six columns of good proportion form the façades.

There are also the New church in the Gens d'Armes platz by Kemmeter, having a tower similar to that of the French church; the church in Mittelstrasse, erected 1678-87; the church of S. Sophia, with a fine tower and spire 230 feet high; that of S. Louisa; Trinity church; a church in the Exercier platz, erected in 1844; and the church of S. Dorothea, which contains a *chef d'œuvre* of the sculptor Schadow, a monument to Count de la Marck, who died 1787, and is Schinkel's design (not executed) for the church of S. Gertrude in the Spittelmarkt, is given in *Sammlung*, pl. 31-4, as well as his executed designs for one in the Oranienburg district, pl. 87 to 97; those for the small ones in front of the Rosenthal gate, pl. 137 and 150; that in Moabit, pl. 137 and 149; that in the Weidendam, pl. 138 (not executed); and that in the Gesundbrunnen on the same plate. The later churches are that of S. Mark in the Weberstrasse, by Stüler, completed 1854, in the Byzantine style, of brick, with a cupola 100 feet high and 50 feet wide, raised on eight columns, 40 feet high, of sandstone (*EGGERS, Deutsches Kunstblatt*, 1853, p. 102); of S. Matthäus, near the Thiergarten, and of S. James, both by Stüler, completed 1846, of brick, and of a basilican form, the latter having a large portico. The Roman Catholic church of S. Michael has been erected since 1850, by Soller, of brick, in a mediæval and Italian style; the cupola, surmounted by a cross, is 150 feet in height. Its total length is 194 feet, the nave 30 feet, and the side aisles 12 feet broad, and the transepts 97 feet 8 inches long. S. Peter's church, by Strack, built in 1848-54, of brick and sandstone, is in the Gothic style and in the form of a cross, with five towers; four of them are 142 feet high, and the chief tower 200 feet, of brick, with a spire of 107 feet in height of iron and zinc of remarkable construction; altogether it is the highest tower in Berlin. The church is 181 feet long, the vaultings 48 feet span and 86½ feet high. *Deutsches Kunstblatt*, 1853, p. 104.

Two new synagogues have been built; the one 130 feet long, 50 feet broad, and 60 feet high, erected 1850 by Titz; the other in an Italian style with Arabian *motives*, and remarkable for its interior decoration, was completed 1855 from designs by G. Stier.

The *Schloss* or royal palace, situate in the *Schloss Platz*, is

460 feet in length next the river, 276 feet in breadth, 101 feet in height including the balustrade, and contains four open courts and about six hundred habitable apartments. Within it are the great library, the royal treasury and archives, the picture gallery, forming a narrow passage 196 feet long; the *Salle blanche* or White Hall, 105 feet long, 51 feet broad, and 41 feet high, completed 1846 by Stüler; museums of natural history, mechanical arts and the fine arts; and over the principal entrance three great reservoirs, containing 7,000 tons of water. The river wing was built 1538; the south side was commenced by Schlüter, about 1694; the east side during 1699-1700 by Schlüter; the east end of the north façade towards the *Lustgarten*, was also built by him until 1706; the west end was by Eosander von Göthe; and the elongation of the south front was done strictly after Schlüter's design by his pupil, Böhme, in 1715. The five story building separating the courts was erected 1594, by Rocher von Lynar; the west side of the courtyard by Eosander von Göthe. The new Royal chapel, commenced in 1847 after Stüler's designs by Schadow, is 84 feet in diameter, 108 feet in internal height, and is externally 225 feet high to the top of the cross; it is enriched with marbles and frescoes, and was consecrated 18 January 1854.

Amongst the other palaces are that of the Minister of War, in Leipziger strasse, restored in 1846-7 by Stüler, which has a fine garden attached; that of Count Redern, in 1833, by Schinkel (*Sammlung*, pl. 143); that of Prince Frederick altered by Schinkel in 1816, and restored by Hahnemann in 1852; that of Prince Charles, in Wilhelm's platz, altered by Schinkel (*Sammlung*, pl. 171), with a fine armoury; that of the Minister of Justice; that of the Prince William of Prussia, a greater part of which was rebuilt by Langhans in 1834, and nearly completed in 1836: designs were furnished by Schinkel (*Sammlung*, pl. 157-161); that of Prince Albert in Wilhem's strasse, a handsome edifice, 158 feet by 72 feet high, erected after the designs of the hôtel de Soubise at Paris; with a colonnade, etc., added by Schinkel in 1832; and the Royal Palace of Monbijou, with handsome gardens, pavilions, hothouses, etc., erected in 1708 by Eosander von Göthe; the wings, new façade, and other portions, were added by Unger in 1790.

Amongst the most important public buildings are the *Land-schafts-haus* or provincial house of assembly for the representatives of the Mark of Brandenburg; the Palace of the Princes (*Fürstenhaus*), now the property of the civic authorities and used as the *Rath-haus*, erected in 1674; the *Collegien-haus* (*Kammergericht*), the supreme judicial court, rebuilt in 1734 by Gerlach; the *Börse* or Royal Exchange, erected in 1801-5 by Becherer and Simon, the hall of this building is 50 feet by 30 feet, with sixteen Doric columns each in one block of free-stone, 2 feet 6 inches in diameter and 14 feet high; the Royal Guardhouse in *König's platz*, a quadrangular structure, erected by Schinkel in 1818 (*Sammlung*, pl. 1-4); and the principal or New Mint (*Haupt-Münze*) erected about 1794-1800 by Gentz; the Old Mint now contains several sculptors' studios.

The *Lustgarten*, in the rear of the palace, contains the *Old Museum*, originally known as the *Museum*, being a magnificent structure built by Schinkel in 1823-29, on upwards of 1000 piles from 48 to 50 feet long. Its dimensions are 273 feet long by 170 feet wide, and 60 feet high to the top of the entablature. It contains a rotunda with a cupola 65 feet wide and 70 feet high; a hall 208 feet long by 31 wide; two smaller halls, each 125 feet by 29 feet, and other apartments; on the staircase is placed the statue of the Amazon by Kiss. In the front are eighteen Ionic columns, forming a vestibule 16 feet deep, which was covered with frescoes during 1844-5, and stands on a basement broken by a wide flight of steps (*Sammlung*, pl. 37-43 and 103-109). The vase in front is of one piece of granite, 22 feet in diameter, and 75 tons in weight. The *New Museum*, connected with the former one by a covered way over the road, is by Stüler, and was completed February 1848. It is about twice the extent of the first erected Museum, and Berlin is worth

visiting if only for this one building, which is a monument worthy of the artist engaged on it and the nation that raised it. The hall and staircase are noble and richly decorated by Kaulbach, and each gallery has its appropriate decoration for the treasures that it contains. A general plan, shewing the arrangement of the two museums, is given in the *BAUZEITUNG*, pl. 522, first series.

Among the literary and educational establishments may be noticed the Royal library, erected by Fischer von Erlach in 1774-80, a very tasteless building, the principal apartment of which is 263 feet long and 59 feet wide, and contains more than 600,000 volumes, besides 5,000 manuscripts. The New Observatory finished in 1836 (*Sammlung*, pl. 153-4), by Schinkel, has a revolving cupola 24 feet in diameter. The *Bau-schule* or Architectural academy by Schinkel is deserving of attention from the use of terra cotta ornamentation. It is illustrated in the *BAUZEITUNG*, pl. 1 to 8, first series; and in the *Sammlung*, etc., pl. 121-126, and 151-2. The Vocal academy (*Sing-Academie*) was erected by Ottmer of Brunswick; it is a building 140 feet long by 60 feet wide, and is now (1855) used for private lodgings; *Sammlung*, pl. 20-1, shew designs by Schinkel for a similar building. The University buildings, formerly the residence of Prince Henry of Prussia, were erected in 1754-64 by Boumann, Sen.; they contain lecture-rooms, museums, etc., around three sides of a quadrangle; the façade has a portico of six Corinthian columns; it was founded in 1810, and is attended by 1800 students. The *Joachims-thal* or Royal gymnasium, with four courts, was founded in 1607 and completed 1717. The school for the Artillery and Engineers in the *Unter den Linden*, is by Schinkel (*Sammlung*, pl. 23, 112). The *Königliche Thierarzneischule* or Veterinary school, an admirably arranged establishment, with lecture-room, amphitheatre, garden, laboratory, infirmary, etc., was designed by Hesse in 1840; it is illustrated in the *BAUZEITUNG* for 1843, pl. 494, etc. A model prison, on the Pentonville system, was erected 1843-4 to hold 520 persons. The Royal York Lodge of Freemasons is held in a building erected 1712, after a design by Schlüter.

There are seventeen public hospitals, and eight military infirmaries; seventeen barracks; eight royal magazines inside, and four outside, the walls. Amongst them may be noticed the hospital of *La Charité*, the largest in Prussia, with 800 beds, it was founded in 1711, and increased in 1785 by Unger, it forms three sides of a quadrangle with other buildings; the Royal hospital for Invalids maintains nearly 1,000 soldiers, and consists of a main building with two wings, and a separate church for Protestants and Roman Catholics; it was erected 1748. The *Friedrichs Waisenhaus*, or Frederick's hospital and orphan asylum, maintains 350, and boards 650 other children. It was commenced 1697-1707, by Grünberg, who erected the front next *Stralau strasse*, and one wing of the court. Gerlach added the water side front, the chapel and its façade, 1707-16. The tower of wood was added 1727-8, to a height of 268 feet, but reduced in 1782 by more than three-quarters. It was damaged by fire in 1809. The great new hospital, *Bethanien*, was erected by Stein in 1846, and has a fine chapel: STEIN, *Das Krankenhaus Bethanien*, fol. 1850. The great S. Nicholas hospital has large buildings.

The *Zeughaus* or arsenal, a massive structure possessing much merit, forms a square of 280 feet in length, and is of Italian architecture; the apartments on the first and second floors form a kind of military museum. It was commenced by Nehring, who died 1695, and was succeeded by Grünberg, and afterwards by John de Bodt, who entered the Prussian service about 1700. The great barracks of the Ulans was built by Drewitz in 1846-49; it is 531 feet long, with three towers 100 feet in height. The new great barracks outside the Halle gate have also been built by Drewitz about 1849. The *Cadettenhaus* was commenced by Nehring, and enlarged by Unger. The *Neue Packhof*, or General Board of Trade, was built about 1835,

after a design by Schinkel. The new Royal mills were built in 1486 by Dannenburg, in form of a Gothic castle with several towers.

Berlin has also royal and other manufactories, which consist of the *Eisengiesserei* or iron foundry, near the Oranienburg gate; the royal iron foundry; the royal porcelain manufactory; the *Messingwerk* or brass foundry (given in *BAUZEITUNG*, pl. 357, first series); the manufactory of gold and silver works; the zinc works; the Eckartstein manufactory of earthenware; and A. Borsig's iron foundry, etc., which is illustrated in the *BAUZEITUNG*, pl. 575, etc., first series; it was erected by Strack, 1846-49, and is an excellent construction of brick, with a good villa and hothouses.

Amongst the places of amusement are the *Schauspielhaus*, or theatre, a large effective building, erected by Schinkel about 1824, in the *Gens d'Armes platz*. The Ionic hexastyle portico of six columns is 38 feet high, standing on a steep flight of steps surmounted by a pediment, over which is an attic with a pediment enriched with sculpture. The theatre will hold about 1,500 spectators, and is 245 feet long, 155 feet wide, and 103 feet in height; it has recently been restored. The concert room attached, which will hold about 1,200 persons, is 56 feet long, 44 feet wide, 43 feet high, with galleries, and is much admired for its architectural proportions and decorations; it is given in *Sammlung*, pl. 7 to 18. The *Königsstädtisches* theatre was built in 1824, by Ottmer, but it has recently been altered for use as private lodgings. The Opera house, with three rows of boxes, and accommodation for 3,000 spectators, was erected by Knobelsdorf in 1701, and considered the most magnificent ever built in Europe; it was 226 feet long by 103 feet wide and 73 feet high. The concert hall was 100 feet long by 50 feet wide and 30 feet high. Having been destroyed by fire Aug. 19, 1843, it was rebuilt by Langhans, and opened 7 Dec. 1844, and is perhaps the most splendid and comfortable in Europe. It holds 2,000 spectators, and is 265 feet long, 104 feet wide, and 73 feet high; the proscenium is 34 feet wide; the concert room is 100 feet long, 50 feet wide, and 30 feet high. It has two porticos of six Corinthian columns, with a relief in the frontispiece by Rietschel. It is said to have cost £87,500 (600,000 dollars). The *Friedrich-Wilhelmstädtisches* theatre was completed in 1850 by Titz, and has fine decorations by Gropius; it will hold 1,600 persons. A good garden with fountains, etc., and a large summer theatre built of wood, by Titz, is attached. The buildings of the Zoological gardens were designed by Strack in 1842-3, and are illustrated in *BAUZEITUNG*, pl. 94, second series. The circus in Charlottenstrasse was erected 1852, by Titz, in the style of the Alhambra; and the circus, of an octagonal form, in Frederick street has been recently erected by Hitzig; it is decorated with large frescoes by Steffek, containing the history of the art of riding.

Among the minor erections, the *BAUZEITUNG* illustrates a storehouse designed by Hesse in pl. 536, first series; a dwelling for a small workman's family, pl. 262, second series; the *Dampfwäschanstalt* or laundry near the Moabiterbrücke, pl. 196 (1848), second series; and besides the buildings to which Schinkel's name is attached in this description, the following will be found illustrated in his *Sammlung*, etc.; a dwelling for Herr Fichner, stove manufacturer, pl. 113-4; and a storehouse near the Schloss bridge, pl. 127-30, etc. Gerson's mansion and magazine on Werder markt was built in 1848 by Stein, and is remarkable for its interior decoration. The *passage* from *Unter den Linden* to *Wilhelmsstrasse*, having a fine hall of the Doric order, was erected about 1820 by Schinkel.

Of the railway stations that of the Hamburg railway, built in 1845-6, by Neuhaus, has a large hall of iron of an excellent construction. Outside the Brandenburg gate is the *Thiergarten*, containing walks, avenues, etc.; a statue of Frederick William III, which with the reliefs of the pedestal is by Drake, the pedestal was designed by Strack; a great area for military exercise; the handsome palace of prince Augustus;

many pretty villas by Knoblauch, Strack, Stüler, Hitzig, Titz, etc. (as likewise those in the *Bellevue strasse*); and Kroll's garden, which occupies the whole of the further end. The original edifice was gutted by fire February 1851. It was a large building, erected 1843-4, in the Italian villa style and was used for balls, concerts, exhibitions, etc.; Persius was first employed, but it was carried out from his designs by Knoblauch, to whom solely is due the king's saloon, which is 100 feet long by 80 feet wide. The main building is 380 feet long, of brick, and covered with zinc; the cost was £36,000: *BAUZEITUNG* for 1846, pl. 54, ARCHITECT, etc., *Journal*, ii, 268, give illustrations. It has been rebuilt much in the same character, and presents a peculiar illustration of German customs. Opposite to Kroll's garden is a group of three houses joined by porticos, forming a fine work by Strack, they contain the studio and residence of Cornelius; the picture gallery, etc., of Count Raczynski; and several royal studios for painters.

Outside the Halle gate is the Kreutzberg, on which stands the military monument erected by the king in 1820, from designs by Schinkel; it is a turreted Gothic superstructure of iron, with twelve chapels beneath it, dedicated to the twelve principal battles of 1813, 1814, and 1815: the substructure is of stone, raised on a terrace 80 feet in diameter. The statues also of iron were modelled by Rauch, Tieck, and Wichmann.

In the environs are situated the town of Charlottenburg, the 'Richmond' of Berlin; it is about one and a half German miles distant, and contains the royal palace founded by Frederick I, and finished by Frederick II; it was erected by Schlüter, amplified with wings and a tower by Eosander von Göthe; the interior ornamentation, containing excellent reliefs by Schlüter, is remarkable. In the extensive pleasure grounds is situated the mausoleum of the Doric order designed by Schinkel, recently altered by Hesse, and decorated with frescoes, contains the fine monument by C. Rauch, of queen Louise; *BAUZEITUNG*, pl. 619, first series. A country house of the bankers Behrends, designed by Schinkel, is given in *Sammlung*, pl. 36. POTSDAM and its palaces will form a separate article.

Plan of Berlin, No. 165 of the *Maps* of the SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE; FUNCK, *Plans de la salle de l'Opéra, bâtis par le baron de Knobelsdorff*, obl. fol., Berlin, 1743; SCHINKEL and BERGER, *Sammlung Architectonischer Entwürfe*, fol., Berlin, 1819; SCHINKEL, *Decorations auf den beiden Königlichen Theatern*, obl. fol., Berlin, 1819-24; STÜLER, *Das Neue Museum in Berlin*, imp. fol., Potsdam, 1850, issued in ARCHITECTONISCHE ENTWÜRFE; CORNELIUS, *Designs for Frescoes in the Campo Santo*, fol., Berlin, 1848; STEIN, *Das Krankenhaus, etc., the Hospital of the Institution of Deaconesses at Bethany near Berlin*, fol., Berlin, 1850; PLATTNER, *Monuments de Berlin*, fol.; GUIDE DE BERLIN, *Potsdam, et ses Environs*, 8vo., Berlin, 1802; BERLIN and its Treasures, in progress, 4to., London, 1853-5; NICOLAI, *Beschreibung von Berlin*, 3rd edit., 8vo., Berlin, 1786; COSMAR, *Wegweiser durch Berlin und Potsdam*, 15th edit., Berlin, 1855; RELSTAB, *Ansichten von Berlin (mit Stahlstichen)*, Darmstadt. The dimensions given herein are Berlin feet, each foot being equal to .992 English. The article has been revised, etc., at Berlin by W. LÜBKE, Ph.D.

BERLIN (MEISTER BERNHARD OF), finished in 1474 the chapter house of the monastery of Grey Friars in that city. The building, altered in the eighteenth century, is now occupied as a royal gymnasium for upwards of 400 youths.

BERMEKYN is sometimes incorrectly written for BARMKYN.

BERN (the Latin BERNA and ARCTOPOLIS). The capital of the canton of the same name in Switzerland, and also the reputed metropolis of the Swiss confederation. It is situated on a sandstone promontory formed by the river Aar, that bounds the town excepting on the western side, which is defended by fortifications. The old inconvenient approach from

the east was remedied in 1840-44, at a cost of £50,000, by a bridge 412 feet long between the toll-houses, but inclusive of the viaduct 909 feet in length, the segmental central arch of which, placed between two semicircular land arches 50 feet wide, is 156 feet 8 ins. in span, and rises 60 feet high above the springing, or 84 feet above low water of the stream. A full account of this work, which is called the Nydeck bridge, from the castle and church in the vicinity so named, is given in the *BAUZEITUNG* for 1843, p. 190, pl. 539-542. The city having been destroyed by fire in 1405, was rebuilt on a very regular plan; and the citizens consider it not only the handsomest town in Switzerland, but one of the most elegant in Europe; the houses are built of stone; those in the principal streets stand on arcades carried by massive pillars. These arcades form covered walks on each side of the streets, which are of considerable width, and chiefly run from east to west. The arcades are built with shops, but the arches are low and the piers very solid, so that the footways are close and gloomy. There are three old watch towers in the line of the principal street; and the *barrières* of Aarberg and Munten deserve notice. The first stone of the Gothic *munster* or cathedral church was laid in 1421: the edifice was finished to a certain extent in 1457, when the works were stopped; it was completed as now seen in 1502, but the tower, 190 feet in height, is still incomplete. The cost of the building, which is 160 feet long and 80 feet broad, was 100,000 guilders, or about £12,500. The church contains some good glass, and has cloisters which are much admired. One of the architects employed was Mathias, a son of Erwin von Steinbach of Strasburg: he also built in 1344, at a cost of 50,000 guilders, or about £6,250, the wall, 108 feet high, which supports the ground of the *place* in front of the cathedral, forming a splendid esplanade and point for a panoramic view. The plain but elegant church of S. Esprit was built in 1704.

The most remarkable of the other public establishments are the old and heavy *hôtel de ville*, a structure of the fifteenth century; the *Aussere Standes Haus* or *Stadthaus*, anciently the Marksman's guild, in which the meetings of the Diet are held when the deputies assemble at Bern; the new prison and penitentiary, called the *Schaller Haus*, built of freestone, which is the largest of its kind in Switzerland, and was erected on the panopticon principle of Bentham at the suggestion of Howard; the extensive hospitals called the *Burgerspital* and *Inselspital*, one of which extends along a whole street, and was formerly the only grand building, except the cathedral, in the town; the large and splendid corn market and magazine or public granary, supported on thirty-four pillars; the bank; the public library, placed over the butter market; the museum, the arsenal, and the mint, designed by ANTOINE; two orphan hospitals; the infirmary; the handsome casino; and the *hôtel de musique* or theatre. Besides these are several buildings devoted to educational purposes, as the academical *lyceum*, converted in 1834 into an university; the *gymnasium*, which was remodelled at the same time; the school of drawing; the school of arts; and an establishment for the deaf and dumb.

BERNABEI (GIOVANNI) is entered in the roll of architects employed upon the *duomo* at Orvieto in the year 1501. 67.

BERNALDO DE QUINTANA (LUCAS) was engaged 10 March 1410 to reconstruct the church of S. Pedro at Gijón in Asturias, which has since been enlarged. 66.

BERNARD (SCRIPTION) was appointed 11 December 1528 to assist Martin de Chambiges as colleague to Jean Vast the younger, in the direction of the works to the cathedral at Beauvais. His pay was 30 livres (120 francs of the present time) per annum, with six working days per week at 5 sous (1 franc) for each day. WOILLEZ, *Descr., etc., de Beauvais*, 4to., Beauvais, 1838, p. 6.

BERNARD (.....), see BERNARD.

BERNARDINE BUILDINGS, see CISTERCIAN BUILDINGS.

BERNARDINO (AUGUSTIN) began in 1613 the foundations of the collegiate church of S. Nicolas at Alicante in Spain, of which the first stone was laid 9 March 1616: the design and details of this edifice entitle him to be considered one of the best architects of his time and country, having adopted the style of Juan de Herrera. He continued the work until his death, of which event the date is not known; his successor, Martin de Meta, died however in 1630. 66.

BERNARDO (IL MAESTRO), see FLORENCE (BERNARD OF), and VENICE (BERNARD OF).

BERNEVAL (ALEXANDER DE) is commemorated by a monumental brass in the chapel of S. Agnes, in the church of S. Ouen at Rouen, on which are the effigies of himself and a younger man (whose name does not seem ever to have been inscribed) under rich canopies, with the inscription, "Cy gist maistre Alixandre de Berneval, maistre des œuvres de machonnerie du Roy nre Sire du baillage de Rouen et de ceste eglise qui trespassa l'an mil cccxli le v jour de Janvier pries dieu pour l'ame de luy", given in WILLEMIN, *Monumens Français inédits*, fol., Paris, 1839, pl. 159, 160. It appears that Berneval executed the transepts of the church of S. Ouen; at least POMMERAYE, *Histoire de l'Abbaye*, fol., Paris, 1662, p. 197, ascribes to him the design of one rose window, and the murder of his apprentice, who designed the other, and is supposed to be the subject of the younger effigy: but POTTIER, in the text to Willemin's plates, repudiates the legend. A third effigy, on a brass close to the above, has entirely lost the name of the other architect represented thereon.

BERNHAM (ROBERT DE) preceded Richard de Rochelle and William of Wykeham as surveyor of the works at Windsor Castle. POYNTER, in essay prefixed to *Illustrations of Windsor Castle*, fol., London, 1841.

BERNIER (.....) was the author of very clever designs for the mansion No. 9, rue Lepelletier, executed in 1802, and given in NORMAND, *Paris Moderne*, 4to., Paris, 1837, i, 62-64.

BERNINI (GIOVANNI LORENZO), son of the Florentine painter and sculptor Pietro, was born at Naples 7 December 1598. He distinguished himself as a sculptor in Rome at a very early age, and was made *cavaliere* by pope Gregory XV (Ludovisi, 1621-23). His first works in architecture were fountains (amply illustrated by FALDA), such as those of the Triton in the piazza Barberina, of the great obelisk in the piazza Navona, and of the galley in the piazza di Spagna; various tombs; the baldachino in S. Peter's (1633) (ROSSI, *Altari*, II); the repairs and one front of the collegio à Propaganda Fide (FALDA's *continuation*, 60; FALDA, iv, 51); the two campaniluzzi to the Pantheon; with the restoration and remodelling, the façade and vestibule (1625) of the church of Sta. Bibiana on the Esquiline (FALDA, iii, 23), all of which works were executed under pope Urban VIII (Barberini, 1623-44), who made him, on the death of Carlo Maderno, in 1629, chief architect to S. Peter's, with Borromini as his assistant. In that capacity he executed the four niches in the piers which support the cupola, and erected on the south or right hand side of the front of the church, next to the palazzo del S. Uffizio, a campanile which was destroyed in 1647. About the year 1635 he executed the frontispiece containing the balcony called the *loggia della benedizione* of the palazzo Pontificio on the Quirinal (FERRERIO, 2); and about the year 1639 various works at the palazzo Barberini (FALDA, iv, 17) on the same hill: some writers ascribe to him the entire design, others the completion only of this palace; but MILIZIA specifies the staircase, the great saloon, and the façade towards the Via Felice as his work (FALDA, iv, 17-20; ROSSINI, 3). The palazzo appears, according to LETAROUILLY, p. 388, to have been commenced by Carlo Maderno, and jointly continued by Borromini and Bernini, to the last of whom he attributes the hinder portion, the right hand staircase, and the *cordona* or *scala a bastoni*, and the façade at the back of the building.

During the pontificate of Innocent X (Panfilii, 1644-55) he

was superseded at S. Peter's by Borromini; but he was engaged about the year 1651, by the prince Ludovisi, a nephew of pope Gregory XV, to commence the great palazzo di Monte Citorio, afterwards della Camera Apostolica; and he built the chapel of Federigo Cornaro (the transeptal ones, according to D'ARGENVILLE) in the church of Sta. Maria della Vittoria (ROSSI, *Disegni di vari altari e cappelle nelle chiese di Roma*, 21, 22); about this period may be placed the erection of other chapels, of which the dates are not ascertained, viz. the Raimondi in the church of S. Pietro Montorio (*Ibid.* 8, 9); Allaleona in that of SS. Domenico e Sisto a Montemagnanapoli (*Ibid.* 20); the Fonseca in that of S. Lorenzo in Lucina (*Ibid.* 49, 50); the Silva in that of S. Isidoro (MILIZIA); and one said to be on the right hand of the high altar in S. Peter's, all in Rome; the Siri at Savona; and the Rospigliosi, or at all events its altar, at Pistoja. It may be supposed that at this time also he designed, if it be true that he was employed on them, such works as the cathedral at Terni; the porta Nuova at Ravenna (1653); the villa Rospigliosi (MILIZIA) at Pistoja; the completion (MILIZIA) of the theatre at Parma, which is ascribed to Palladio; and at Rome the order and lantern (MILIZIA) of the cupola to the church of the Madonna di Monte Santo; the sacristy of that of Sta. Agnese in the piazza Navona (D'ARGENVILLE); the triangular church of the Sapienza (D'ARGENVILLE); as well as the church of Sta. Anastasia, at the foot of the Palatine towards the Velabrum (FALDA, iii, 28); his claim to the staircase and vestibule of the palazzo Doria Pamfili is advocated by LETAROUILLY, p. 202; and DALLAWAY, *Anecdotes*, 8vo., London, 1800, p. 107, particularly alludes to his having "filled up with apartments the grand colonnade which remained of the basilica of Antoninus at Rome, which is now the *dogana* or custom house."

Pope Alexander VII (Chigi, 1655-67), immediately upon his election, made Bernini his private architect, and *architetto alla Camera Apostolica*, the latter office, usually given to the artist employed by each cardinal before his elevation to the papacy, was enjoyed for the remainder of his life by Bernini, who was also restored by the same pontiff to the supervision of S. Peter's, and employed in the design and execution of the celebrated chair (ROSSI, *Altari*, 12); the entire paving to the inside of the church; the colonnades and semicircular porticos forming its ATRIUM or *cortile*, being ranges of three hundred and twenty columns, each 4 feet 5½ inches in diameter, of the Doric order without triglyphs (FALDA's *Continuation*, 60; FALDA, i, 3, iii, 3; ROSSI, 8-10); the magnificent staircase called the *Scala Regia* (FALDA, 5; ROSSINI, 12), a work of great difficulty and merit, generally said to have been commenced under Urban VIII; the restoration of the Chigi chapel; the restoration and modernization, with the assistance of Carlo Fontana, of Rainaldi's churches at the porto del Popolo (FALDA, 8); the inner front of that gate (1655-57); the continuation of the palazzo della Camera Apostolica, or Curia Romana, or Curia Innocenziana, as it is variously called (ROSSINI, 36; FALDA, iv, 31), which was completed under Innocent XII, either by Mattei dei Rossi (MILIZIA), or by Carlo Fontana; the additional buildings to the palazzo Quirinale (FALDA, 13); the front, if not the whole (MILIZIA), of the palazzo (planned according to most writers by Carlo Maderno) in the piazza dei SS. Apostoli, for the cardinal Flavio Chigi, afterwards called the palazzo Bracciano, but now Odescalchi (FALDA's *Cont.*, 57; FALDA, ii, 4; iv, 26; BLONDEL, *Cours.*, viii, 65); the front, if not all of the oval church of S. Andrea al Noviziato dei PP. Gesuiti on the Quirinal (FALDA, iii, 13; ROSSI, 23-25), considered by Bernini himself as his masterpiece; and the erection of the obelisk in the piazza di Sta. Maria sopra Minerva; as well as the church or cupola of the church of S. Tommaso de Villanueva, and the gallery and façade towards the lake of the palazzo, both at Castel Gandolfo (FALDA, ii, 9, 10); the circular church of the Assumption (1664) with the palazzo Chigi (1664), both at L'Ariccia (FALDA, ii, 14, 15); and the arsenal at Civita Vecchia (FALDA, ii, 10).

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In 1665 he visited France, at the urgent request of Louis XIV, and made a design, different from one which he had previously sent from Rome, for the completion of the palace of the Louvre. From the day of that invitation until the day of his return to his own house, he was treated as a princely stranger; indeed, M. de Chambray, Seigneur de Chantilou (brother of Roland Freart de Chambray, author of the *Parallèle*), who was sent to receive and remain at the side of Bernini, was so sensible of the responsibility attached to the duty, that this *maitre d'hôtel du Roi* kept a diary of their joint proceedings, which journal was used by the author of the article "Bernini" in the *BIOGRAPHIE UNIVERSELLE*. It is to be regretted that the names have not been preserved of other works for which Bernini is said to have given designs while in Paris. His idea for the completion of the Louvre and its connexion with the Tuileries (*Grand Marot*, fol., Paris, 1713 or 1727; BLONDEL, *Cours.*, viii, 66; *Petit Marot*, pl. 1) was commenced during his presence, but neglected immediately after his departure. It was not until that occurrence that the design by Perrault was shown to the king, according to the *Mémoires* of Charles Perrault (published by the architect Patte, 12mo., Avignon, 1759), which contain some interesting notices of Bernini (totally opposed to the ideas generally formed of the skill in design, knowledge of construction, or courtesy of behaviour ascribed to that artist); and entirely dispose of the anecdote as to his surprise and praise at the sight of Perrault's (MILIZIA also says at Chambray's) design, recorded by many writers, and endorsed, if not invented, by VOLTAIRE, whereas LEROY has shown that the story was really referable to Serlio and Lescot.

On his return to Rome, and in the pontificate of Clement IX (Rospigliosi, 1667-70), he completed the southern portion of the *cortile* of S. Peter's; executed the *cordonata* (or inclined plane) called il *Padiglione* up to its entrance; and added the balustraded parapet and other decorations to the bridge of S. Angelo.

Under pope Clement X (1670-76), he added the summer rooms at the palace of the Quirinal, and repaired the palazzo della Cancelleria erected by Bramante, which seem to have been his latest building operations.

The principal tombs which he erected are those of Urban VIII and Alexander VII in S. Pietro; the Marcanda in S. Lorenzo in Damaso; the Raggi in Sta. Maria sopra Minerva; and one in the church of the Convertite: he also designed the altars in the Rospigliosi chapel at Pistoja, in the church of S. Andrea della Fratte (LETAROUILLY, p. 325), and that of S. Calisto, the lower altar in that of Sta. Francesco Romana, and the great altar in that of S. Lorenzo in Damaso.

He died 28 November 1680, after a life of almost incessant labour and prosperity, and was buried in the church of Sta. Maria Maggiore. The memoir by his son Domenico BERNINI, *Vita*, 4to., Rome, 1713, may be compared with BALDINUCCI, *Vita*, 4to., Florence, 1682; MAZIO, *Memorie inedite della Vita*, published at Rome without date; and SILORATA, *Biografia*, 8vo., Rome, 1833, who enumerate as his pupils Matteo dei Rossi, Francesco Mochi, Carlo Fontana, Giambattista Contini, and Borromini.

The illustrations mentioned in the preceding lines are contained in FALDA, *Il Nuovo Teatro*; FERRERIO, *Palazzi di Roma*, with FALDA's continuation and *Nuovi Disegni*, etc.; ROSSI, *Insignium Romæ Templorum*, etc., fol., Rome, 1684; ROSSINI, *Monumenti di Roma*; ROSSI, *Vedute in Roma*; LETAROUILLY, *Rome Moderne*, 4to., Paris, 1849. FALDA, *Fontane di Roma*, 52, also gives as a work by Bernini the fountain called the *Acqua Acetosa*.

BERRETINI or BERETTINI (PIETRO), sometimes called PIETRO DA CORTONA, from having been born 1 November 1596 in that city in Tuscany, was a pupil of his father Giovanni, and of Baccio Carpi, and was best known as a painter. He was made *cavaliere* by pope Alexander VII, in recompense for his exertions in the internal and external restoration and alteration,

with the portico of the church of Sta. Maria della Pace at Rome (FALDA, 26-28; ROSSI, 72; LETAROUILLY, p. 204); and in compliance with a request from the French monarch he competed with a design for the Louvre at Paris against Bernini and Rainaldi. Amongst his other works of architecture were designs for the palazzo Sacchetti, beyond the porta Angelica, at Ostia (FALDA, iv, 44); and in Rome, the tombs of the Amici family in the church of Sta. Maria sopra Minerva, and of the Montauti in that of S. Girolamo alla Carità; the chapel of the Conception in the church of S. Lorenzo in Damaso; the chapel of S. Francisca Xaviera in the Chiesa del Gesù (ROSSI, *Altari*, 47); the capella Gavotti in the church of S. Niccolò da Tolentino (ROSSI, *Altari*, 23, 24); the capella Santissima in the church of S. Marco; the façade of the church of Sta. Maria in Via Lata (FALDA, 17; ROSSI, 51; LETAROUILLY, p. 472), reputed to be his masterpiece; the cupola, transept, tribune, and interior decorations of the church of SS. Ambrogio and Carlo in the Corso (ROSSI, 54), commenced by Onorio Lunghi; and his own house, of the Doric order, in the Via Petacchia, near the tomb of Bibulus.

He founded and built the church of SS. Maria Martina and Luca Evangelista, otherwise called S. Luca in Martina, near the arch of Severus in the Campo Vaccino (FALDA, iii, 5; ROSSI, 34-7), which he considered the best of his performances; he died, however, 16 May 1669, before its completion, for which he left ample funds. ROSSI, *Disegni di vari Altari*, etc., fol., Roma, 17, 18, gives the high altar of this church. FALDA, *Il Nuovo Teatro*; ROSSI (Rubeis) *Insignium Romæ Templorum*, etc., fol., Rome, 1684. FALDA, *Fontane di Roma*, 12, gives the Doric niche and fountain of the palazzo Barberini *alle quattro Fontane*.

BERRUQUETE (or more properly **PLATERESQUE**) **STYLE**. A term used by English writers in conformity with the customary expressions of Spanish authors for that phase of the Renaissance style which was the fashion of the sixteenth century in Spain, and derived one of its denominations from the sculptor, Alonso Berruguete (born at Paredes de Nava, 1480, died at Alcalá, 1561), who, on his return from studying in Italy, carried to the highest perfection in the shrines, altar pieces, and tombs, which he executed in Spain, a richness of ornament and luxury of detail which, as applied by others to architectural works of greater importance, rendered them liable to the reproach of being as delicate as the productions of workers in gold and silver plate. In fact the style combines the delicacy and fancy of the French Renaissance with the grotesqueness of Elizabethan art. The best examples of this style are probably those buildings which have been supposed to be designed and erected by the master himself. The works attributed by NAGLER to Berruguete are, the *Casa del Ayuntamiento* at Seville, which was finished in 1564, and the palace of Carlos V in the Alhambra. LLAGUNO observes of the first named building, that the architect is not known, that the style is *plateresque*, and that Juan Sanchez, *maestro mayor* of the works of the city, was engaged on that building from the year 1545. The same author, in speaking of the palace in question, assigns the design to the Machuchas and other masters, whose succession is given; but Berruguete might have been engaged upon the decorations. MILIZIA and VASARI ascribe to this artist the archiepiscopal (?) palace at Alcalá, but the Spanish authorities state that this was designed by Juan Bautista Monegro in 1617, continued by Sebastian de la Plaza in 1621, and finished by Juan Gomez de Mora. The works which were executed after the deaths of Velez and Mendizabal, in the style of Berruguete, and, during his lifetime, to the cathedral at Cuenca, were by Jamete, 1537-1549; and thus could not have been done by Berruguete, to whom they have been assigned, as well as the *puerto S. Martin* at Toledo, of which the architect is unknown: indeed, LLAGUNO particularly states that he knew of no architectural work by this artist.

MILIZIA, attributing with hesitation to him some other works, and observing that Charles V was desirous of having him for

his architect and honoured him with the order of the golden key, adds "it is thought that he designed the palace at Madrid, most sumptuously rebuilt by that sovereign, but it no longer exists."

BERTANO (GIAMBATTISTA), see GHISI (GIAMBATTISTA).

BERTHAULT (LOUIS MARTIN), born at Paris about the year 1771 (1783, NAGLER), was able, at fifteen years of age, to maintain himself as a draughtsman, and with the advice of an uncle, who was an architect, to obtain reputation for designing *parcs à la mode Anglaise*, although he had not studied the subject theoretically, had seen few examples, and had of course little experience. His reputation, however, recommended him to the empress Josephine, who entrusted him with the gardens at Malmaison, which he so entirely altered as to excite first the indignation and afterwards the approbation of the emperor. With the latter event he received the appointment of architect for the restorations at Compiègne, and was employed not only to design but to commence the palace and gardens for the king of Rome in his future capital. He was also directed to submit a plan for the palace which Napoleon had proposed to build at Chaillot near Paris. As landscape-gardener to Josephine he received commissions from all parts of Europe, besides those for the grounds at S. Leu, Bondy, Pont-Chartrain, Ruslay, Armonvillers, and Beauregard. On the Restoration he retained the posts of architect to the palaces of Compiègne, and of the legion of honour, which Napoleon had bestowed upon him. Berthault also restored several Parisian houses, amongst others the Hôtel d'Osmond on the Boulevards, and the Hôtel de Recamier in the Chaussée d'Antin. The principal country houses erected from his designs were those at La Jonchère, Clichy, and Château-Margaux near Bordeaux. His fortune enabled him to see his family occupy a property at Chantilly, which had been the scene of his earliest experiments, and a handsome house built by himself in the rue Neuve des Mathurins at Paris. He died in August 1823.

BERTHOLD, see MAULBRONN (BERTHOLD VON) and WALKER (BERTHOLD VON).

BERTHOLET FLEMAËL (....), born at Liege in 1614, studied as a musician in Belgium until, as a painter, he went to Italy in 1638. He returned to Belgium in 1647; became professor of painting in the Academy of Fine Arts at Paris; revisited Belgium; built, at S. Remi on the Meuse, a house that cost 50,000 florins (£4,000 of that time); became a canon of the collegiate church of S. Paul at Liège, where he designed the Carthusian church; and that of the Dominicans, which is a rotunda in form, in a very good taste; he died there in 1675.

BERTINORO (the ancient FORUM TRUENTINORUM). A city situated on the river Ronco in the States of the Church in Italy. It contains a cathedral dedicated to S. Catherine, not much visited by strangers; three churches and five convents.

BERTOTTI SCAMOZZI (OTTAVIO), born at Vicenza in 1726, was the first person elected, as being at the time the leading architect in Vicenza, to be the tenant for life of the property and name of Scamozzi, who could hardly have anticipated that his successor's chief claim to reputation would have rested on a magnificent edition of the works of Palladio, entitled *Le fabbriche e i disegni di Andrea Palladio raccolta ed illustrati*, da O. B. S., 4 vols., fol., Vicenza, 1776-83; this was reprinted in 1786; and again edited by Foppiani, Genoa, 1842. A smaller edition was also published in 4to., Vicenza, 1797. During the progress of this work Bertotti attended to several buildings in Vicenza and its neighbourhood; he erected at Castel Franco in the neighbourhood of Trevigi, for the cardinal Giovanni Cornaro, a gallery or loggia, and attached dormitory for strangers; at Scantripo, for the counts Trissini, a palazzo; another with a beautiful loggia, for the counts of Schio, at Alpiro; and in Arcugnano, a house with a loggia for the Franciscan monks. He died about the year 1800.

BERTRAM'S CEMENT, see SERCOLLANE.

BERYNGER (HEINRICH) was *baumeister* of the Petripauli-kirche at Liegnitz between the years 1378 and 1384. 92.

BESANÇON (the Latin VESONTIO and CHRYSOPOLIS). A city, the seat of an archbishopric, and the capital of the department of the Doubs in France. The ancient and interesting upper town or *ville haute* stands on a bend of the river Doubs, the portion which is not washed by the stream being occupied by the steep rock called the Mont S. Etienne, where the cathedral dedicated to that saint stood until its destruction about the year 1668, to make way for the citadel planned by Vauban. This fortress, which is cut in the rock rather than built, causes Besançon to rank as a fortified place of the first class. The upper town communicates with the *ville basse*, also called *Ballaus*, on the other side of the river, by means of a bridge of modern construction on Roman foundations.

The whole city exhibits remains of the Latin occupation of the territory. Marble and other columns, statues, mosaic pavements, and foundations of large buildings, have been reburied or destroyed; but remains of an amphitheatre outside the walls, and of the aqueduct, seven miles in length, from the village of Arcier, combine with the *porte taillée* and the *porte noire* to excite attention. The *porte taillée*, now a passage way for travellers, is reputed to have been originally tunneled through a ridge of rock which lay across the line of the aqueduct. The *porte noire* is said to have been erected as a triumphal arch in honour either of Aurelian or of Crispus the son of Constantine the Great. It is in tolerable preservation, and exhibits an unusual arrangement, the arch springing from the level of the entablature of a composite order, some of the columns of which are *banded*; and the general entablature standing upon a second story, being of much smaller columns, apparently of the same order. Views and details are given by LABORDE, *France*, fol., Paris, 1816, pl. 109 and 110, and by TAYLOR, *Voyage Pitt.*, fol., Paris, 1825 (Franche Comte), pl. 104-106, who also gives, pl. 107-112, interesting views of the cathedral and of the cavern *la glaciére*, which is a natural ICE HOUSE.

Though preserving the appearance of an old town, by being surrounded by the ancient wall with eight towers and six gates, this city is one of the best built in the country. The streets are spacious, and the *places*, which are of considerable extent, are ornamented with fountains. The houses generally are built of hewn freestone, two or three stories high, with balconies. The present cathedral, originally dedicated to S. Jean, but under the invocation of SS. Jean and Etienne after the destruction of the other cathedral (at least from the year 1049 until the junction of the two chapters in 1253, the city preserved, as Lisbon still does, two churches claiming to be cathedrals), is a work of the eleventh century, according to BOUASSÉ, *Cathédrales de la France*, 8vo., Tours, 1843, who describes the body of the building as being in the style *Romano-Byzantine* (the apse is at least of that style, even if other portions belong to the thirteenth century), but the lower part of the church as exhibiting modern architecture. DE MOLEON, *Voyage Liturgique*, 8vo., Paris, 1718, p. 155, mentions that the altar was placed in the middle of the church, which was turned towards the west. The *clocher* fell in 1726.

At the close of the eighteenth century Besançon contained eight parish churches, which were comparatively modern structures, and the collegiate church of Ste. Madeleine, besides twenty-one convents and monasteries, a commandery of the order of Malta, a house and college of the Jesuits and a *seminaire*, as well as the buildings necessary for a *parlement*, university, and mint. Several of these buildings have been devoted to other purposes, and the present principal public structures are the *palais de justice*, built in 1749; the *hôtel de ville*, dating from the sixteenth century; the *hôtel de la préfecture*; the college founded by the father of cardinal Antoine Perronet Grenville, and enlarged by the son, who was archbishop of Besançon from 1584 to 1586, and built the *palais Grenville*, now the public library, in the style *de la Renaissance*, having superimposed

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orders, as in the "schools" at Oxford; the courts of justice, of first resort, and of commerce; the general hospital of S. Jacques with five hundred beds; two other hospitals; the academy of arts and sciences; the *seminaire*; the school for the deaf and dumb; besides the theatre, the artillery school, the barracks, and several medical and agricultural associations. DUNOD, *Histoire*, 4to., Dijon, 1735.

In the environs of the city are the splendid ruins of the Château de Montfaucon, supposed to have been built by Louis XI.

BESANTS, see BEZANTS.

BESIL is sometimes written for BASIL.

BESNARD (....), was author of a pavilion given by NORMAND, *Paris Moderne*, 4to., Paris, 1843, ii, pl. 1-3; executed in 1790 in the gardens called the Park of Monceaux, Faubourg du Roule, which were also rearranged by him about 1804, and given in detail by KRAFFT, *Plans des plus beaux Jardins*, etc., fol., Paris, 1810, ii, pl. 65-6.

BESNATI or BISNATI (ALESSANDRO), not BERNATTI, as written by CICOGNARA, was appointed one of the architects to the *duomo* at Milan, 17 September 1609, and died 9 March 1617. His son GIOVANNI PAOLO was appointed to the same post 22 May 1617, and made a design for the façade of that edifice, which is given by FERRARI, *Raccolta*. 27.

BESTIARIUM. A term now used by many Italian antiquaries to express the place where the beasts were kept that were destined to fight with the *Bestiarii* in the amphitheatres of classic times. It is employed instead of the old phrase "vivarium", which seems rather to have been a place to fatten animals (particularly fish) to serve for food. PLINY, *Hist. Nat.*, ix, 54-56; JUVENAL, *Sat.*, iv, 51; HOR., *i. Ep.*, l. The most singular of these buildings now exists on the Monte Celio, close to the church of SS. Giovanni e Paolo at Rome, and is given in PIRANESI, *Antichità*, iv, 53, et seq.; and still better in CANINA, *Edifici di Roma Antica*, iii, 35. It consists of two ranges forming sixteen arched cells, each about 18 feet by 15 feet, of the very boldest and most picturesque character of rusticated work. The upper cells have doors, and so communicate the one with the other; and are supposed to have contained the smaller animals: the lower cells have no access except from the front, and are supposed to have contained the more ferocious beasts. Considerable attention has been lately given to this edifice, as an arched way or *emissarium* has been discovered in the Colosseum (nearly a quarter of a mile off), which is supposed to have been the covered passage through which the animals were conveyed for the sanguinary sports of the arena.

The word *bestiarium* is often used by mediæval writers to signify a series of works much in vogue in their times, being a history of all beasts real and fabulous, with certain symbolisms of the different virtues and vices supposed to be represented by each, as well as certain legendary predilections said to attach to them, and the moral lessons to be derived therefrom. A study of these works would probably elucidate some of the grotesque carvings in many parts of religious edifices. The *bestiarium* of Picardy has lately been published by MARTIN and CAHIER, *Mélanges d'Archéologie*, 4to., Paris, 1847-50. A. A.

BETHELL'S PATENT FOR PRESERVING WOOD. This patent was obtained in 1838, and consists in thoroughly impregnating the wood with oil of tar containing creosote and a crude solution of acetate of iron, commonly called pyrolignite of iron. The operation is carried on in a strong cylindrical vessel connected with a powerful air-pump, so that in the first instance a vacuum being formed, and subsequently a pressure of several atmospheres applied, the liquid may as much as possible be forced into all the pores of the wood. It is stated that wood thus prepared is not only protected from decay and from the attacks of insects, but also that it becomes stronger and tougher in consequence of the layer of bituminous matter with which the woody fibre becomes encrusted. The process has been extensively employed in the preparation of railway sleepers for more than two years (1851), and the result of its application appears in every case

to be highly satisfactory where the process has been well and properly conducted. *Reports of the Juries, etc.*, 8vo., Lond., 1851, p. 122. Attention has been called to the highly inflammable qualities of wood so prepared, which has been accused of hastening the combustion of the material where the process is applied.

BETHEN (HEINRICH) was consulted by the Domcapitel of Magdeburg, in 1493, on the continuation of the building. 92.

BETHERSDEN MARBLE. A fine grained limestone, either veined and granular, or of one even or simple grey color, and similar to that known as Purbeck or Petworth marble, but distinguished from it by the shells being larger. It is found chiefly about five miles from Ashford in Kent, and is sometimes called Lovelace marble, from these quarries being on an estate of the earls of Lovelace. It was much in use in the last century for tables, chimney pieces, and other ornamental purposes. Most of the shafts, strings, and caps, of the Early English portions of Hythe church in Kent are said to be of this material, and in some parts of that county it is varnished, for protection from the action of the weather. PURBECK MARBLE. W. H.

BETHISTANA, or more properly ATHISTANA, a corruption of ADHISHTHANA, is the generic term used in some parts of Hindostan for the base of a pillar. RAM RAZ, *Essay*, 4to., London, 1834, p. 26, observes that the height of the shaft or pillar (*padha* or *sthamba*), exclusive of the capital (*prastara*), is to be divided into four parts, and one to be given to the base, which may or may not be accompanied by a pedestal (*upapitha*). There are twenty-eight species of the *adhishthana* or base given by the author above cited, out of the sixty-four defined in the Hindoo works on *silpa sastra* or architecture. W. H.

BETHSAN in Palestine, the modern name of SCYTHOPOLIS.

BÉTON (Ger. *kiesmortel*). The French name for CONCRETE. As there are, however, some important differences between the modes followed by foreign architects and engineers in the preparation of artificial foundations, and those adopted in this country, it may be as well to maintain a distinct use of two words, applying to *béton* the sense of a foundation executed as described below, and to *concrete* the ordinary English signification.

Bétons are invariably composed by, first, mixing the proper proportions of lime and sand, either by hand or by a pugmill, in the same manner as for ordinary mortar. Great importance is attached to the choice of the lime and to the mode of slaking it: indeed, when it is not possible to obtain at a moderate cost lime naturally hydraulic, it is customary to use artificial puzzolanas in order to communicate to rich limes the requisite hydraulic powers; and the mode of slaking is prescribed in the specification, according to the nature of the lime, instead of being left to the choice of workmen. The mortar so prepared is then mixed with broken stone or ballast in such proportions as shall ensure its filling up the intervals between them; the volume of these intervals having been ascertained by pouring upon the dry stones, enclosed in a vessel of known capacity, the quantity of water necessary to fill the vessel. From numerous observations it appears that the spaces are equal to about 0.38 to 0.46 of the cubical contents of the vessel; but in practice it is customary to introduce about one-fourth more mortar than would be required merely to ensure the solidification of the mass, especially when the *béton* is intended to resist water pressure.

CLAUDEL, in *Formules, etc., ou Aides Mémoire des Ingénieurs*, etc., 3me edition, 8vo., Paris, 1854, p. 658, gives the following proportions of mortar and stone, according to the nature of the works in which it is proposed to use the *béton*, the latter being called rich or poor, according to the proportions of mortar employed.

Name	Mortar	Propor. of 1.00	Observations
Rich Béton	0.55	0.77	Reservoirs, etc., where there is great pressure of water.
Ordin "	0.65	0.78	Same "
"	0.18	0.36	Same "
Rather poor "	0.45	0.90	Same "
"	0.38	1.00	Same "
Very poor "	0.20	1.00	Same "

The proper portions thus ascertained are mixed, by means of iron rakes, until the stones are entirely covered with mortar, and the materials are then wheeled, upon the level, to their intended situation, and rammed carefully until the mortar begins to work up to the surface. It is considered, in fact, that *béton* is neither more nor less than a species of masonry composed of small materials, and it is therefore executed with nearly as much care as ordinary walling. Such can hardly be said to be the case with *concrete* works as ordinarily executed; but the principal difference between the two may be said to consist in this, that when *béton* is used, mortar is made before the stones or ballast are introduced; but when *concrete* is used, the lime is slaked upon, and mixed at once with, the stones or ballast, without the adoption of any intermediate process to ensure its hydration. The machine for making *béton*, used in the building of the Panorama at Paris by Hittorff, is illustrated in the *BAUZEITUNG* for 1843, pl. 571.

SMEATON, *Eddystone Lighthouse*, fol., Lond., 1813; VICAT, *Resumé des Connaissances positives actuelles sur les Mortiers*, etc., 1828; and numerous contributions by this and other authors in *Les Annales des Ponts et Chaussées* and *Les Comptes rendus de l'Académie des Sciences*. G. R. R.

The *BAUZEITUNG* for 1838, pl. 219, p. 260-263, illustrates the museum, etc., in the Jardin des Plantes at Paris, the foundation walls and arches of which were chiefly of *béton* made as therein described.

Many Norman constructions in England are supposed to be entirely a species of *béton*. One of the most curious specimens is the soffit of the winding stairs at Rochester Castle, which shows to this day the marks of the joints of the centering or 'waling boards' on which it was thrown. Another instance is cited by VIOLETT-LE-DUC, *Dict. s. v.*, p. 226, as existing at Carcassonne, where there are a great number of large flat lintels of *béton* over the interiors of doors and windows; not one of them is broken, though they have a bearing of about 4 feet, are 1 foot deep, and are only 10 inches high. A. A.

BETTA. The particular name, signifying a "hill", allotted to that species of the JAIN TEMPLES which consist of an open area surrounded by a wall, and containing the image of Gomuta Rāya, one of the twenty-four siddhas or deified heroes of the Jain religion. BUCHANAN, *Journey from Madras*, 4to., London, 1807, iii, 82.

BETTING POST or BETTING RING. Two concentric circles of strong posts and rails about four feet high, fixed upon a race course. The inner circle of 23 feet radius, for pedestrians, is laid with gravel sloping upwards from the rails to the centre, forming a slight mound, and approached by a fenced path through the outer circle; the latter is of 40 feet radius, and has two gates, namely for the ingress and egress of horsemen, who are thus protected from the crowd outside, and pedestrians from the horsemen, so that bets can be laid or other negotiations made with personal safety by all who are within the respective enclosures. R. R. R.

BETTING ROOM. A subscription club-house (without any culinary accessories) in which subscribers meet to make bets and to settle past wagers. Any complete edifice designed for such a purpose should comprise an entrance porch with book-keeper's desk; a lavatory, water closet, urinals; a recess for hats, coats, canes, whips, and umbrellas; a spacious saloon, along the sides and ends of which a platform should be placed elevated a few inches above the floor, and supporting a continuous range of sofa seats. Other seats, and tables amply provided with newspapers and stationery, should occupy the middle of the saloon. Hypæthral fenestration is preferred; the room being principally used at night requires to be warmed by open fires, ventilated, and well lighted artificially by chandeliers and sconces. R. R. R.

BETTINI (GIOVANNI) is only incidentally mentioned by MILIZIA, s. v. Alberti; but the notice is important, as it attri-

butes to him the design of the façade of the church of Sta. Maria Novella at Florence, finished in 1470 or 1477, because "it is in the Gothic or German manner."

BETTOLI (ANTONIO), a pupil of Fenouille, erected in 1784 the façade of the church of S. Agostino at Parma, and died there in 1789. 103.

BETTOLI (CRISTOFORO) designed and executed for duke Ferdinand I. (1765-1802) the Porta Nuova at Parma. 103.

BETTOLI (NICOLA) designed and commenced in 1822 the new theatre at Parma. Paolo Toschi with him directed the ornamentation and all that was necessary for the completion of the building, which was opened 16 May 1829. TOSCHI, *Il Nuovo Teatro*, fol., Parma, 1829.

BETULA, the BIRCH (It. *betulla*; Sp. *kaya*; Fr. *bouleau*; Ger. *birchenbaum*). An ornamental forest tree, common to North America and Europe. The wood is generally white shaded with red, compact, and easily worked. The chief varieties have not much durability; they are therefore more used in cabinet work than for building purposes. Some specimens of the Russian birch, the Russian maple of commerce, are of a full yellow colour and very beautiful. The birch, generally, is of little use until it has attained the age of sixty or eighty years, as previously the wood is liable to warp and to be attacked by worms. The bark is remarkable for its durability, remaining uncorrupted for ages, even in situations exposed alternately to air and water, cold and heat. In some countries it is used as a coping to walls, and is placed over the masonry of vaults under ground, as lead is in England, to prevent the moisture of the soil from penetrating through it; and it is for a similar reason wrapped round sills and the lower ends of posts and other pieces of wood inserted in the ground, to preserve them from decay. Plates of the bark are extensively used in the north of Russia in the roofing of houses, being laid, as slates are in England, on boards which are secured to the rafters: the B. papyracea is used for a like purpose, large slabs being placed under the shingles of the roofs of houses. Trees long since prostrated are often met with in the forests, which appear sound externally, while the bark only contains a friable substance like mould. HOLTZAPFFEL, *Descr. Catalogue of Woods*, etc., 8vo., London, 1843; MICHAUX and NUTTALL, *North American Sylva*, 4to., Philad., 1841-2; *The Economical Uses of the Birch Tree*, in the PENNY MAGAZINE, xii, 91 and 109. ALNUS; CARPINUS.

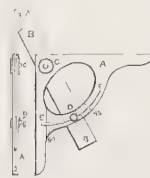
B. acuminata; tapering leaved B.; Nepal; is used by the natives for all purposes where strength and durability are required; and B. leptostachya, and B. bhojpatra, Indian paper B., are good woods of Nepal. B. pendula, weeping B., is the most graceful of the genus; and B. nana, dwarf B., forms a small bush. The other species are not of much value. 14. 71.

BETUNE (ROBERT DE), prior of Llanthony, being appointed to superintend the erection of a religious house at Weobley, worked upon it himself. When made bishop of Hereford, in 1151, he is said to have erected the north end of the nave of his cathedral church. He died at Rheims in 1148, but was buried at Hereford. WHARTON, *Anglia Sacra*, fol., London, 1691, ii, 297.

BETWAH or PUTTOWAH. A village which once formed a part of the suburbs of Ahmedabad in Hindostan, but is now about five miles distant from the walls of that city. It is mentioned by FORBES, *Oriental Memoirs*, 4to., London, 1813, iii, 101, in the highest terms, on account of the fine buildings still remaining in the cemetery of the ancient city.

BEVAGNA (the ancient MEYANIA). A city in the Papal States in Italy, but now not much larger than a village. It contains a collegiate church, formerly a cathedral, dedicated to S. Michele; a very handsome church of the Preaching Friars; and a grand convent with a corresponding church of the Augustinians, as well as an hospital and a few other small public establishments. ALBERTI, *Notizie Antiche e Moderne riguardante Bevagna*. 96.

BEVEL or BEVIL (Fr. *biveau* and *bureau*). An instrument in general use for taking angles amongst masons, carpenters, joiners, and other trades. Formerly it consisted of two straight legs turning upon a common centre at one end: the first improvement seems to have been the addition of a screw to fix them, and afterwards a slot, so that one arm could be longer or shorter as required; the next improvement was a quadrant fixed to the side of, or in, one of the legs; but this was found to be inconvenient and inaccurate, as well as inapplicable in many cases. The obvious remedy for some of these defects was the adoption of a quadrant fixed to a square, and the use of a movable blade working on a centre at the angle; but this was found equally inaccurate, and also liable to derangement. The final improvement seems to be that invented by Mr. Quarm, and rewarded by the SOCIETY OF ARTS, etc., *Transactions*, 8vo., London, 1843, liv, 125, which answers for a square, a common bevel, and a mitre-bevel of forty-five degrees. In the illustration, A is the *stock*, composed of brass or gun



metal; B, the *blade*, made of steel, and turning on the *centre-pin*, C, with a *set-screw*, D, which works in the *groove*, E E, and thus allows the blade to be set at any angle with accuracy. Bricklayers and masons have also a bevel, by which they cut the under sides of arches, straight or circular, to such angles as the arches require; and consequently one or both legs

frequently have a given curvature. When the interior angle of the bevel is that used by the workman, the instrument is called a JOINT HOOK, and is fixed for setting out the intradoses and radiating beds of arch stones which, for circular arches, are alike in every part of the arch. A bevel for taking curved lines by means of a steel riband fixed at one end of a leg of the bevel, and kept to the curve by cross screws, is described by HEBERT, *Engineers and Mechanics' Encyclopaedia*, 8vo., London, 1836, i, 165. 2. 14.

BEVEL is also applied in masonry and brickwork to a sloped or canted *horizontal* surface. The term *SPLAY* is properly restricted to openings which have their *vertical* sides sloped for the purpose of enlarging such openings. CANT; CHAMFER.

BEVEL ANGLE is the name by which every angle, whether acute or obtuse, is known, except one of ninety degrees, which is always called "a right-angle", and one of forty-five degrees, which is "a mitre-angle". W. H.

B. alba; common or Norway B.; attains about 2 feet diameter and 80 feet in height. It is most common in Europe, and especially in the Russian empire; the wood, though of an inferior quality, is sometimes employed in ship building, but it is chiefly useful for a host of minor purposes; and in artificial plantations in Great Britain it is useful as coppice wood.

B. lenta; black, sweet, or cherry B. of Canada, and the mahogany or mountain mahogany of America; 2 to 3 feet diameter, and 70 to 80 feet high; has a close-grained reddish brown timber, which is variegated, and, from its taking a fine polish, it is valued for cabinet work next to the wood of the wild cherry tree. When coloured and varnished, it is hardly discernible from Honduras mahogany, but warps very much. Being of quick growth, it has been recommended for plantation in the valleys of the mountainous districts of Britain.

B. lutea or excelsa; tall or yellow B.; Nova Scotia, etc. 2 feet diameter, and 60 to 70 feet high, with an uniform straight trunk. The bark is a bright golden yellow colour, and the wood is in appearance of an inferior quality, but it is strong, takes a good polish, and stands well when always in water. The boards of this species were formerly largely imported into Ireland and Scotland.

B. nigra or angulata; black B.; south part of the United States. 70 feet high; the wood is compact and very nearly white, longitudinally marked by red veins, which intersect each other in different directions.

B. papyracea; white, paper, or canoe B., so called from its bark being formed into canoes; Lower Canada and north part of the United States. 3 feet diameter, and 70 to 80 feet high. The heart of the wood is of a reddish hue, and has a fine glossy grain, with a considerable share of strength. It speedily decays when exposed to a succession of dryness and moisture.

BEVERLEY. A handsome market town, and the capital of the Eastern Riding of the county of York in England. The houses, far from uniform in size or character, are chiefly well built of brick, and form one main street about a mile in length, terminating northwards in an old gateway, and broken by thirteen cross streets, some of which are spacious: all the streets are paved with *cobbles* or pitching, and the principal ones have flagged footways. The town is lighted with gas, and amply supplied with very hard water from wells and borings in chalk, many of which form artesian fountains.

The most important edifice is the minster or collegiate church of S. John, "a building much less known than it deserves to be", which replaced one burnt in 1188. It chiefly belongs to the First Pointed style, but many portions exhibit Second Pointed Gothic art. It is 334 feet 4 inches long, 64 feet 3 inches wide across the nave and aisles, 167 feet 6 inches long in the transepts, and 67 feet high in the nave; the height of the two western towers is 200 feet; all these dimensions are given in the plate by Vandergucht (1713) after Hawksmoor. Of the earlier work, the piers, rose windows, triforium, and a staircase are remarkable; these with an elevation of the north transept are given in RICKMAN, *Attempt*, 8vo., London, 1848, which also illustrates the Decorated windows, and the arcade on the side walls of the aisles. The same work states that this edifice has the first and finest of Perpendicular west fronts (described at some length), and places the north porch "as a panelled front, perhaps unequalled", the third in the list of Perpendicular porches. A representation of the north front of the transept, which overhung, and of the timber framing by which it was brought back into its place, invented by Mr. W. Thornton, a carpenter of York, as well as a section of the trusses and building of them, were engraved by Fourdrinier (1739) after Geldart. The elevation of the south transept is given in BRITTON, *Arch. Antig.*, 4to., London, 1826, v. The church contains the celebrated Decorated Gothic monument called the Percy shrine, which is now considered to be the tomb of Idonea, widow of Henry Percy, second Lord Percy of Alnwick; she died in 1365. The interior of the minster has been repaired and restored, since 1825, by the resident architect, Mr. Cosins, a pupil of Shute of York.

The large church dedicated to S. Mary is also a cross church with aisles to the nave, and two elegant octagonal staircase turrets at the west end; it is chiefly of the Decorated Gothic style, and has windows of elegant flowing tracery; an arch and the screen on the north side of the choir are carefully illustrated in the above cited edition of RICKMAN, which also gives the simple but effective Perpendicular south porch. Eight chapels; the guild-hall and council chamber (1805), forming a modern wing to the mean town-house, in Register Square; the town gaol at the back, occupying the old guildhall, since the removal thence of the county gaol; the register office (1800); the theatre for 630 persons (1804); the assembly room (1763); the dispensary in Register Square (1828); the news room; and the temperance hall, are the other chief buildings of a public nature in the town. There are also several schools, almshouses and minor charitable and educational institutions. The cross in the market place was erected in 1711. The town has the advantage of 1174 acres of adjoining common land. Outside, but near the north bar, is the sessions house for the East Riding of the county, with a tetrastyle Ionic portico, the court room, 70 feet long by 35 feet wide, the gaol, and the governor's house, designed by Mr. Watson of York, in 1804, and finished in 1814, at a cost of £8,550, but at a great loss to the builder. POULSON, *Beverley*, 4to., London, 1829; OLIVER, *History*, etc., 4to., Beverley, 1829; BUCKLER, *View*, engraved by Lewis, 1816; JOHNSON, *Views of Beverley Minster*, fol., London, 1845.

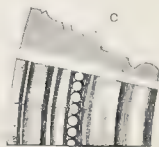
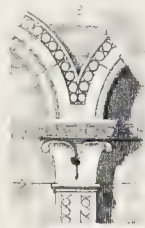
BEVIGNATE (FRA), born about the year 1250, took at an early age the Benedictine habit among the Sylvestrine monks. His first architectural work at Perugia was the aqueduct executed in 1322, as shown by an inscription given in

PASCOLI, *Vite*, 4to., Rome, 1732, who attributes to him the cathedral and the bridge called Ponte Nuovo over the Tiber, and styles him "one of the restorers of ancient art" in Italy; whereas other authorities ascribe to him the church of S. Ercolano, rebuilt at Perugia in 1325 in a Pointed style: the majestic *palazzo Comunale* is supposed to have been also designed in 1333 by him. Bevignate died about 1350, aged 95, or older.

BEZANT. A name which has been adopted to a considerable extent for one of the means employed in the decoration of moldings, and even of flat faces, especially in Norman architecture. This form of ornament appears to have been forgotten in the thirteenth century, and to have revived only lately in the Anglicised Classic styles of the present century. A similar de-



coration, A, appears in a fragment, from the tomb of Agamemnon at Mycenæ, in the British Museum. The bezant consists in a circular disk or plate, flat on its face, and either rising from the ground of a panel, or projecting from the face of the work. When curved on the face it is a *button* if small, a *patera* if large; and when the section is more than a segment of a sphere it is a *pearl* or a *ball* according to its size. In the GLOSSARY, *Descriptive Index of Plates*, s. v. "Moldings", pl. 111, the bezant there called a flat billet is illustrated from an example at Canterbury Cathedral. VIOLLET LE DUC, *Dict.*, s. v., "baguette" and "besantée", gives the following examples of the



bezant, which like the preceding instance, belong to the twelfth century, and directs attention to the bevelling of the sides of the plate.

BEZIERS (the Latin BITERRÆ). A city and formerly the seat of a bishopric in the department of the Herault in France. It is surrounded by an ancient wall flanked with towers, and according to DE CAUMONT, *Cours d'Antiquités Monumentales*, 8vo., Paris, 1838, iii, 496, possessed an amphitheatre of which the arena, 256 feet long by 197 feet wide, and several other



portions, may still be traced. The cathedral, dedicated to S. Nazaire, is remarkable for the fortress-like aspect of the exterior,

the effective size of the interior; the singular supports to the case of the organ, and its fine cloister which is little known; the central tower remains unfinished; there is some ancient glass, but little else interesting to the artist; NODIER and TAYLOR, *Voyage Pittoresque* (Languedoc, fol., Paris, 1833, ii, part ii, 247-8. Bishop Jean Armand Rotondi de Biscaras (1671-1702) built the episcopal palace (now the *hôtel de ville*?), a *seminaire* for the clergy, and an hospital for the poor. The only other public buildings of interest are the five parish churches; the remains of a collegiate church, formerly the cathedral, and of several convents and monasteries; the public library; and the theatre. In the church of S. Aphrodisius, the oldest one in the place, is a finely sculptured ancient Roman tomb of alabaster now converted into an altar. In the centre of the small public garden at the end of the promenade, is erected of colossal size a noble bronze statue of Jean Paul Riquet, the engineer of the Canal du Midi, that prodigious undertaking uniting the Mediterranean with the Atlantic ocean. 96.

BHADRINATH or BADRINATH (the native VADARINATHA). A small town situated on the river Alacananda, in the province of Ghurwal in Northern Hindostan. It contains few public buildings. The houses, which are one story in height, situated in large and well kept streets and squares, are principally occupied by Brahmins and other attendants on the temple, who generally quit the place during winter, and return in time for the reception of the pilgrims, whose numbers sometimes amount to 50,000. The town is chiefly celebrated for the temple, which is endowed with the revenues of about seven hundred villages in the vicinity; it is made conspicuous among the other religious structures by its copper dome, of a conoidal shape, the outside of which has been gilt, but is now much tarnished. A suspension bridge across the river is about 200 feet long by 8 feet wide, made of bamboo laths and poles, and coir or bass rope. W. H.

BHATGONG or BHATONG (the native DHARMAPATAN). The chief city of Nepal in Hindostan. It is said to have formerly contained 12,000 houses, in broad streets planted with trees, and in squares ornamented with fountains. Though now much decayed, it is still a favourite residence of the Brahmins, whose dwelling houses are built with considerable taste, and sumptuously decorated on one side with open corridors to the weather, and on the other with terraced gardens. The temples are small, with the exception of the highly decorated pyramidal one dedicated to Siva. There are several other public buildings; the principal one is the palace of the reigning prince, which is considered by those who have visited it to be one of the most exquisite pieces of architecture in India. The place is celebrated for the excellent quality of its bricks and tiles, in the manufacture of which the Nepaulese excel. W. H.

BHOBANESER or BOBANESWAR (the native BHAVANESWARA). A city in the province of Orissa in Hindostan. It is said to have been founded A.D. 473, and according to Eastern exaggeration it contained ten millions of *lingams*, and seven thousand temples to Mahadeva, which are now represented by many shapeless masses of brick, and, comparatively, a few deserted and dilapidated buildings of a reddish granite, somewhat resembling sandstone. No woodwork is to be seen throughout, and the stonework of the buildings is secured by iron cramps. The external portions are decorated with a profusion of sculptured ornaments, and the ruinous courts are filled with a variety of bulls, *lingams*, and other symbols of Mahadeva. The great temple or *vimana* of the Ling Raja (Siva) was commenced in 614, and occupied forty-three years in execution; it was evidently originally dedicated to Vishnu, and formed a type or model on which all the other temples in Orissa were built: in Bhubaneser alone there are even now not less than a hundred of them of all sizes, from 50 or 60 feet to 100 and 150 feet in height, exhibiting "every gradation of style in the execution of the details, from that of the great one in the seventh, to that of the Black Pagoda in the thirteenth century".

ARCH. PUB. SOC.

An illustration of this chief temple is given by FERCUSSON, *Pictures*, fol., London, 1847, who concludes his description in the following words: "The *vimana*, or temple itself, stands on a base about 60 feet square, and rises to a height of about 180 feet; and the *mantapa*, or porch, is of the same dimensions in plan, but rises only to about two-thirds of the height of the great tower. The temple at Puri is of about the same size, but that at Tanjore is the only one that I have seen in India which exceeds it in dimensions. There are many in India more elegant in their details, and more elaborately ornamented—perhaps, therefore, more beautiful—but no one that I know of is more imposing in effect, or conveys more clearly the idea of solid and lasting grandeur than this; and as it stands surrounded by an immense number of smaller and more modern temples, it forms the worthy centre of an architectural panorama, unequalled at least in Hindostan; for there are more ancient temples in this single deserted city of Bobaneswar than in all the cities of Northern India put together."

BHURTIPOOR. The capital of the district of the same name in the province of Agra in Hindostan. The town, surrounded by a wall about four miles in circuit, is very irregularly built, the streets are narrow, and the houses small, but the latter are two or three stories high, and built of stone. At the north-west portion stood the pentagonal fort, blown up by the British; it had walls of hewn stone 60 feet in height from the bottom of the moat. Within the walls is the governor's house, formerly the rajah's palace, a large and well built structure of red and yellow freestone, in the usual style of the Mogul architects, with pretty gardens and fountains. The barracks and officers' dwellings adjoining are also fine buildings. The chief temple is a stone building; the exterior is plain, but the interior is highly ornamented and coloured. W. H.

BHYENG-TSENG. The native name of a close-grained, compact, grey wood of Amherst, East Indies, which is used for story posts, rafters, etc. It does not appear to be subject to the attacks of insects. 71.

BIADERO (FRANCISCO) in 1660 succeeded Francisco de Campo Agüero in the direction of the works to the cathedral at Segovia. He died in 1678. 3.

BIANCHI, or BIANCO, or DEL BIANCO (BARTOLOMMEO, commonly BACCIO), born at Florence 4 October 1604, was the son of Cosimo di Raffaello del Bianco, and a pupil of Biliverti. He was taken in 1620 as an assistant by Pieroni to Germany, where he spent many years of which no definite account is given in the autobiography printed by BALDINUCCI, *Notizie*, 4to., Florence, 1728, p. 314. He returned to Florence, where he opened a school of the Fine Arts and Mathematics, and was elected a member of the Academy of S. Luke. DEL Rosso, in a statement reprinted in the appendix to MOLINI, *Metropolitana*, 4to., Florence, 1820, shows that he had the modesty to be absent from the meetings of the Academy held 14 November 1634, and on two subsequent days, to choose a design for the front of the church of Sta. Maria del Fiore in that city; but he was present on the 5th and 8th March in the following year, and spoke in favour of the design put forward by the Academy. This design was his own production and not by his pupil Pieratti, as stated by BALDINUCCI and some other writers. The execution of it was commenced 22 October 1636, but the works were soon suspended, on account of the public dissatisfaction with the arrangements. In the following year he was appointed engineer to the Magistrato della Parte at Florence, and in 1642 was for some time engaged on fortifications for the Government of that city. In 1650 he passed through Genoa on his way to Spain, being engaged as a mechanician at Madrid, where he died in 1656, aged 52 (BALDINUCCI); or in 1660, aged 60, according to ORLANDI; or aged 56, as stated by TICOZZI: the Spanish annals of art, however, do not mention him. He left a son, who was educated as an architect, and died in Italy about 1679, aged 37.

BIANCHI or BIANCO (BARTOLOMMEO, commonly BACCIO),

is said to have been a native of Como, who was employed at Genoa on the fortifications and new mole; and designed the majestic college, sometimes called palazzo, for the PP. Gesuiti in the Strada Balbi, built about 1642 at the expense of the Balbi family; the neighbouring palazzo Balbi, now Durazzo, in the Strada Nuova; and another for the same family opposite to it, which last was altered by Corradi: TICOZZI and MILIZIA ascribe to him three palazzi Balbi. These works are given by GAUTHIER, *Les plus beaux édifices de Gènes*, fol., Paris, 1830, i, 1-5, 20-22; who also illustrates his villa Durazzo allo Lerbino, ii, 40-43. He died in Genoa in 1657, the same year in which his son Giambattista died there of the plague; an elder child, Pietro Antonio, full of promise in architecture, had died there previously. SOPRANI, *Vite*, 4to., Genoa, 1768.

These details have been given because NAGLER and other authors have expressed doubts that there were two artists of the name of Baccio Bianchi in Genoa at the same time. The statement of SOPRANI, that the subject of his discourse came from Como, may be compared with the notice in BALDINUCCI that the family at Florence called Como were patrons of the artist's father.

BIANCHI (FRANCESCO) was one of the Florentine academicians consulted 8 March 1635 on the design by Baccio del Bianco for the front of the church of Sta. Maria del Fiore at Florence. MOLINI, *Metropolitana*, 4to., Florence, 1820.

BIANCHI (GIOVANNI BATTISTA), a Veronese architect, designed the *palazzo Allegri* at Cuzzano. 39.

BIANCHI (PIETRO) of Lugano, a member of several academies, inclusive of those at Florence, Bologna, Modena, Venice, Stockholm, Copenhagen, and the Royal Institute of British Architects, made the designs for the buildings of the piazza, and of the large church of S. Francisco di Paula at Naples, erected in 1824. He published *Osservazioni sull'Arena e sul Podio dell'Anfiteatro Flavio*, fol., Rome, 1812, and died toward the close of the year 1849.

BIANCHI (RAIMONDO) was practising at Rome about the year 1720. CRESCIMBENI, *Istoria della Basilica di Sta. Anastasia*, 4to., Rome, 1722.

BIANCHINI (MARC ANTONIO), after the year 1539, enlarged and almost remodelled the church of S. Giovanni Battista, and rebuilt on a new design the church of the Madonna dell' Lame in Bologna. 94.

BIANCO (BACCIO DEL), see BIANCHI (BARTOLOMMEO).

BIANCO (BARTOLOMEO), see BIANCHI (BARTOLOMMEO).

BIANZANI (LUIGI), born at Cremona in 1756, designed the palazzi Fadigati and Curti at Casal Maggiore, and the parish church at Comesaggio. In 1788 he was made corresponding member of the Florentine Academy, for his much admired design of the villa Ala Ponzoni at Borgolieto, near Gussola. He died at Cremona 9 January 1816. 26. 57.

BIARD, also written BIART, BYARD, BYART, and BRIARD (COLIN, i. e. NICOLAS), supposed to have been born at Amboise about 1460, is mentioned in the list of architects consulted upon the erection of the tower of the church of S. Etienne at Bourges, as "having been from childhood always mixed up with and concerned in works of masonry, and amongst other matters entrusted with the commencement of the pont de Notre Dame at Paris, after which he was employed in surveys, works, and reports upon the châteaux of Verpré and Amboise, and latterly at the château of Blois; having always resorted to and kept company with several masters of experience in that branch". His name occurs in the registers of the Chapter of Rouen, who consulted him and Senault in September 1506, as to the construction of the tour de Beurre to their cathedral: in both cases they are described as *maîtres maçons des œuvres du cardinal d'Amboise à Gaillon*: BULLETIN ARCHÉOLOGIQUE, 8vo., Paris, 1843, pp. 468-69. According to DEVILLE, *Comptes des Dépenses de la Construction du Château de Gaillon*, Paris, 1850, p. cv (in which work pl. 14 is assumed to represent a sketch by Biard), this architect is mentioned seven times within the years 1504

and 1506 as receiving payment for his journeys from Blois to Gaillon to visit the buildings in course of construction by the cardinal d'Amboise, and to S. Leu d'Estrées to choose the stone for them.

BIART (PIERRE), born at Paris 1559, died 17 September 1609, and was buried in the church of S. Paul in that city. An artist of this name erected, towards the end of the sixteenth century, the celebrated jubé or rood loft in the church of S. Etienne du Mont at Paris, which is "a fine work, the steps are very ingeniously and boldly suspended, and the design and execution of the stonework are universally admired, but the whole seems overloaded with ornamental work". SAUVAL, *Histoire*, etc., fol., Paris, 1724, i, 407. 60. 83.

BIB. A word formerly used by plumbers for a small APRON of lead.

BIBBIENA or BIBIENA, see GALLI.

BIB-COCK (Fr. *bavette*). A term used in specifications to distinguish a cock which delivers fluids out of a pipe, from a STOP-COCK which is placed in the length of a pipe; the term bib-cock is never used in reference to gas fitting. The handle, as shewn in the illustration, is technically called a 'T key'; a long handle acting as a lever upon the spindle, is called a 'spindler'.



BIBLIOTHECA. A term compounded from the Greek words *βιβλίον*, book, and *θήκη*, repository, signifying an apartment (CICERO, *Fam.*, vii, 28) containing cabinets or sets of shelves (*armaria*, PLINY, *Ep.*, ii, 17, VOPISCUS, *Tacit.*, 8; *foruli*, JUVENAL, *Sat.*, iii, 219; *loculamenta*, SENECA, *De Tranq.*, an. 9; or *nidi*, MARTIAL, i, 118, 15, vii, 17, 5) for books, and also the presses (PAUL, *Dig.*, xxx, 41; ULP, *Dig.*, xxxii, 50), as well as the collection itself (FESTUS, s. v.; CICERO, *Fam.*, xiii, 77; *Attic.*, i, 7). SMITH, *Dict.*, s. v., gives a long list of celebrated ancient public and private libraries, including those of Peisistratos, Polycrates, Euclid, Euripides, Aristotle, Eumenes, the Ptolemies, and Asinius Pollio; as well as those at Rome, in the Capitol, in the temple of Peace and of Apollo, in the porticus Octaviae, in the palace of Tiberius, and, the most famous of all, the Ulpian, formed by Trajan and added by Diocletian to his thermæ. GELLIUS, xix, 15, also mentions one in the temple of Hercules at Tibur. VITRUVIUS, vi, 7, directs that such an apartment should have an eastern aspect; PLINY kept his books at Laurentum in presses recessed in the thickness of the walls of a vaulted circular room, with windows to every quarter of the heavens; and this is all that may be learnt about the architectural character of such a room from ancient authors, except that Asinius Pollio, the first in Rome to found a public library, which he placed in the Atrium Libertatis on the Aventine, was also the first to introduce such decorative accessories as the portraits and busts of celebrated men, and statues of Minerva and the Muses; a fashion afterwards followed in private libraries. (PLINY, *H. N.*, vii, 30, xxxv, 2; *Ep.*, iv, 28; Suetonius, *Tib.*, 70; MARTIAL, *Ep. ad Turan.*) But the discovery in 1753 of a room fitted up as a library at Herculaneum is recorded by IORIO, *Officina dei Papiri*; it was an apartment so small that a person by stretching out his arms could touch both sides of it; it contained more than 1756 manuscripts in separate rolls, arranged on shelves in numbered cases about six feet high, placed around the chamber; and in the centre was an isolated case formed by a rectangular column, which formed a press of shelves on each face. LIBRARY.

BIBRACTE. An ancient name of AUTUN in France.

BICE, formerly written BISE. A pigment also called *iris*, *terre-bleu*, and *blue bice*, from which names it is evident that the colour was generally blue: but green bice is sometimes mentioned, which FIELD, *Chromatography*, 8vo., London, 1841, explains as being blue verditer boiled. Many pigments have passed under this name, which is now obsolete, or at least is not to be found in trade lists. It is supposed to have been properly a light bright blue, prepared from the *lapis armenius*

procured from the silver mines in Germany and the Tyrol, probably a native bicarbonate of copper. Until about the year 1800 it was considered to bear the best body of all bright blues used in common work, but to be the palest in colour and rather gritty if not well ground and washed. 13.

BICKERN, see BEAK-IRON.

BICLINIUM. Properly a couch that held two persons, for reclining upon at meal times, as illustrated by RICH, *Illustr. Comp.*, s. v., and perhaps metonymically the room in which two such couches were placed. PLAUTUS, *Bacchides*, iv, 4.

BIDENTAL. The Latin name for any spot which had been struck by lightning, or on which any animal died from such a cause. Everything that bore the mark of the electric fluid was carefully collected and buried on the scene of the accident; an altar was there raised; a two-year-old sheep, "bidens", from whence the name is derived, was sacrificed; and the spot was enclosed. To remove the boundary wall or fence was considered a sacrilege, but it might be repaired or renewed; ORELLI, *Inscript.*, 2483. It has been stated that such an enclosure was also called a PUTEAL, but there seems to be no authority for the assertion; and it is remarkable that STEPHENS, *Lexicon*, does not quote any passage in which puteal or any of its derivations have such a sense. A. A.

BIDUINUS (MAGISTER) designed several works of ornamental architecture, and is commemorated in an inscription dated 1180, in the church of S. Cassiano, six miles from Pisa, and in another in that of S. Salvatore in Lucca. CICOGNARA, *Storia*, fol., Venice, 1818, i, 323.

BIEDA, in the States of the Church in Italy, see BLERA.

BIELLA (the Latin BUGELLA). A city in the province of the same name in Piedmont, built on the right bank of the river Cervo. The cathedral, dedicated to Sta. Maria Maggiore and to S. Stefano, is an ancient structure rarely visited: four or five other churches; eight monasteries and convents; a seminary; two hospitals; a royal college; and the tribunals of the province, are the only other buildings deserving to be mentioned. 96.

BIENAIMÉ (PIERRE THEODORE), the son of a building contractor, was born at Amiens 11 January 1765. He became a member of the Academy at Carrara, wherein, by an exception to the statutes, he had the honorary distinction of a right to vote; of that at Amiens; of the Société Libre des Sciences, etc., at Paris; and of the Athénée des Beaux Arts in the same city, for which society during twenty-eight years he drew up numerous papers, including the *éloge* of Soufflôt. His life was remarkable for struggles against disappointments. Having settled at Paris to study under the Académie d'Architecture, and having at once obtained in competition the position of *élève-externe*, he had to wait for eight years before he could become one of the foundation-pupils, which was his reward for his success against forty other students; having obtained a medal during each of the four subsequent years, he competed for the *grand prix*, and was honoured by the opinion of the judges, that if the dissolution of the *académie* had been delayed for a single day, he would have obtained the fruits of his victory over the four other competitors. The professor Leroi having established at his own expense similar competitions, named Bienaimé one of the judges, and at a later period this appointment received the sanction of the government, which employed him, in conjunction with Boulet, on matters relating to the legislation with respect to buildings. The republican government offered to receive designs for a monumental column to be erected in each *département*, and the design submitted by Bienaimé was selected from a mass of eight hundred. In other competitions, with money-premiums, Fontaine and Percier took the first place, and Bienaimé the second; in another instance he took the first, and the same rivals the second place; and at last he divided the first prize with them. In 1797 he obtained in competition against Poyel, Brongniart, Calérier, and De Wailly, the commission to reconstruct the *salle* of the theatre Favart. Being

nominated a member of the commission appointed to consider the condition of the pillars under the church of Ste. Genevieve, he reported his calculation of the weight carried by them at 32,346,564 livres, equal to 15,583 tons 13 cwt. 65 lbs.

In 1806 he followed the princess of Lucca to her new territory, and was engaged on several constructions and restorations, especially the interior decorations of the palace at Lucca, when he was ordered to survey the principality; on its completion he was commissioned to execute the suggestions contained in his report for draining marshes, constructing a large bathing establishment at a hot spring, and a village at an alum-mine, both discovered by him; a *place* in front of the palace, a theatre, etc. Before the plans could be completed, his client, being made grand duchess of Tuscany, summoned him to Florence, where he was desired to redecorate the palazzo Pitti, and was preparing his designs when the princess was forbidden by Napoleon to undertake any building operations. He therefore went back to France, and in 1810 visited Montpellier, where he was employed by the Minister of the Interior, for four months, in the preparation of plans for the reconstruction of the *palais de justice*; but on a change of ministry the arrangements were revoked, and Bienaimé returned to Paris. In 1812 he was appointed one of the four architects who designed and arranged that number of cemeteries proposed for Paris; but the funds voted for their payment were absorbed by the expenses of the war with Russia. As some recompense he was commissioned to repair the thermæ in the *rue S. Jacques*, but the works, if commenced, were immediately stopped. In 1823 he was named *inspecteur des bâtiments civils*, in which capacity he superintended the restorations at the church of S. Germain des Prés, until his death, 14 December 1826. Among his executed designs were the Renneval brewery at Exquevilly; the Didot pottery works at Val-sous-Meudon; and the garden façade of a château at Jouy for M. Armand Seguin. GABET adds the reconstruction of the théâtre Favart. The *éloge* by MIRAULT does not seem to have been extensively circulated. 84.

BIET (. . .) removed to Paris in 1823 the façade of a house at Moret near Fontainebleau, and applied it in reconstruction to a house in the quartier des Champs Elysées. The locality had in consequence received the name of the quartier François I. (the façade having been designed in the reign of that monarch); NORMAND, *Paris Moderne*, 4to., Paris, 1841, vol. i, pl. 134-138, who also gives, pl. 87-91, the plan, elevations, and sections of a house built by Biet in 1819, numbered 2 in the *rue de la Tour des Dames*.

BIFFI, see BINAGO (P. LORENZO).

BIFFI (ANDREA) elected, in competition against seven other artists, architect to the cathedral at Milan, 22 June 1679, was succeeded by Giambattista Quadrio in 1686. 27.

BIFORIS, or BIFORUS. A term applied to two-leaved doors and windows by VITRUVIUS, iv, 6, and OVID; and by other authors to places having two doors or openings. VALVATA.

BIGAH or JAREB. Names applied indifferently in India to a quantity of land and to the measure itself. They consist of 3,600 square GUZ, or 60 imperial guz in length.

Unswanseh

20 = 1 Pitwanseh.

400 = 20 = 1 Tiswanseh

400 = 20 = 1 Biswanseh.

400 = 20 = 1 Biswah.

400 = 20 = 1 Bigah.

1 = 60 Guz. English

1 = 31.456 inches.

ROYAL ASIATIC SOCIETY *Journal*, vii, 53, 8vo., London, 1843.

BIGALO or BIGALLO (FRANCISCO), also called FONTANELLA, from his birthplace near Cremona, was appointed towards the end of the sixteenth century architect to the cathedral at Cremona. He designed the magnificent church of SS. Marcellino e Pietro, with the annexed college of Jesuits; the church and convent of S. Imerio for the PP. Carmelitani Scalzi; and the monastery delle Angeli di Sta. Marta, now destroyed; he

restored and enlarged the palazzo Pallavicini in the contrada Ariberti, and many other palazzi in Cremona. 57.

BIGGEH, supposed to be the ancient **ABATON**. An island in the river Nile at a little distance to the south of Philæ. It contains a small temple dedicated to Athor, which appears from the inscriptions to have been commenced by Euergetes, and completed by Ptolemy the elder son of Auletes, and by Augustus or one of the Roman emperors; but there is reason to believe that an older edifice had previously existed on the same site. 28.

BIGGIN or **BIGGING**. This word is generally understood to mean a building of larger size than a cottage, but in the north of England it is chiefly applied to a hut covered with mud (clay) or turf. *ARCHÆOLOGIA*, xvii, 140.

BIGIO (**NANNI DI BACCIO**), son of a Florentine builder, was at first a painter and sculptor, and afterwards a pupil of Antonio Ghiberti da San-Gallo, under whom he was employed at S. Peter's in Rome. In 1552 the repairs to the foundations of the bridge of Sta. Maria in that city were taken out of the hands of Michel Angiolo Buonarroti, by whom they had been commenced under pope Paul III, and entrusted by pope Julius III to Bigio, with full power to conduct them as he pleased. The bridge was made apparently secure, but fell during the flood of 1557. Bigio was subsequently employed to clear the harbour of Ancona; and about 1563 was appointed surveyor of the works at S. Peter's, contrary to the wish of Buonarroti, who caused inquiry to be made into the reports as to the state of the cathedral spread by Bigio, who thereon was dismissed with the reproach that the harbour had been more injured in one day by his operations than by the sea in ten years. **VASARI**, who knew him well, adds that Bigio erected many buildings, both in Rome and outside the city, among which he enumerates the palazzo of cardinal Montepulciano in the Strada Giulia; one of the gates of Monte Sansovino, erected by order of pope Julius III, "with a reservoir of water not yet finished"; a loggia and entire apartments added to the palazzo previously built by the elder cardinal di Monte; and the house of the Mattei family, except the part towards Sta. Caterina dei Funari, which was designed by Ammanato. **BOTTARI** names the palazzo Salviati alla Lungara as one of his works. The date of his birth (about 1510) and that of his death are not recorded.

BIGNONIA. A class of monopetalous trees little known in Europe. Those producing timber are valuable for the property of resisting varieties of temperature, and for the hardness of the wood. They thrive in England, but are chiefly used in pleasure grounds for ornamental purposes; the catalpa and radicans are best known, but they seldom exceed 30 feet in height.

1. *B. lathee*, a very large tree of Tavoy, East Indies, is close-grained, and used for carving.
2. *B. thuggainée*, a large tree of Tavoy, is much used in buildings, as being easily worked, and durable when exposed to the air; it is also used for models, both in British India and by the Chinese.
3. *B. chelonoides*, a large tree of Nepal, is moderately hard, and used for the same purposes as teak; dowels of it about an inch in diameter have been found in the shafts of columns and in ashlar in various buildings in India.
4. *B. leucoxydon* is the white wood or the white cedar of Jamaica. *W. H.*
5. *B. catalpa*; catalpa (*catawban tree*); north of Georgia and West Florida. 50 feet, with a diameter of 18 to 24 inches. Its wood is of a greyish white colour, fine texture, very light, and very brilliant when polished. Posts perfectly seasoned have been proved to be very lasting, by experiments made in the United States. **MICHAUX**, *North American Sylva*, 8vo., Phil., 1818, ii, 63.

BIJANAGHUR, **BIJANAGUR**, or **BISNAGHUR**, the native Vijayanagara or triumphal fortress. A city in the province of Bejjapore in Hindostan. The town, built between the years 1336 and 1343, and sacked in 1564, is separated into Bijanaghur proper, and Annagoondy by the river Toombudara, which is about one-third of a mile broad, and has a rapid course winding among granite hills, and interrupted by detached rocks rising above its surface, which are surmounted by an image of the bull Nundy, an open portico or choultry, or some other

religious edifice. At the principal ferry there is a picturesque group of temples, among which, as well as on the eastern promontory, are huge bassi rilievi representations of the monkey *huvimaurum*. Bijanaghur itself is enclosed on the south and east, partly by natural barriers and partly by strong stone walls with ancient battlements, turrets, and gateways in high preservation, and on the north and west by the river. It occupies an area of at least eight miles in circumference, a large portion of which is, however, taken up by inaccessible acclivities; for the city is situated on a plain enclosed and encumbered with enormous masses of granite, which in some places swell into the form and magnitude of hills, and in others appear piled up in various combinations, occasionally surrounding little isolated vallies, and obstructing all passage except through the narrow winding defiles which separate the fragments. The communications from street to street, and in some cases the streets also, follow the mazes of these chasms; and in one quarter the principal thoroughfare is a covered passage naturally formed by the rocks. The main streets, paved with immense flags of granite, are intersected at intervals by aqueducts; and there are many tanks and wells sunk in the rock. Temples, choultrys, and many other public and private edifices of great dimensions, in the present style of Hindoo architecture, are seen perched upon the eminences of the naked rock, or ranged in lines upon the plain. The walls, pillars, arches, and even the flat roofs and beams of all these structures, are composed of the granite found on the spot, and cut into such masses that it is difficult to imagine how a people ignorant of mechanism could have raised them to their present positions. Some blocks are from 12 feet to 15 feet broad, and thick in proportion; they are fitted to each other with the greatest nicety, and they display even at the present time an exterior lustre surpassing that of most buildings of twenty years standing in the neighbourhood. It is owing to this superiority of material and the Cyclopean style of the masonry, that the ruins of Bijanaghur excel in extent and grandeur those of any other ancient city, purely Hindoo, from Hurdwar to Cape Comorin.

For three miles from the Toombuddra ferry to Humpa, near the western extremity, there is a continued succession of paved streets, with houses nearly uninhabited; the appearance of the ruins about Camlapore on the south-west indicates that they also were once included within the city boundaries. At Humpa there is a magnificent temple dedicated to Mahadéva, surrounded by cells for devotees, and having a pyramidal gateway of ten stories facing the east about 160 feet in height. This edifice terminates a noble street about 90 feet wide, which stretches east and west, nearly parallel to the river, from which it is separated by rows of venerable trees, to another temple near the opposite extremity with an image of the bull Nundy carved out of the rock: the street is lined by a row of handsome stone buildings erected for the accommodation of pilgrims. Between Humpa and Camlapore there is a ridge of rocks traversed by a steep causeway, and studded with pagodas. The most remarkable of these are the great temple to Krishna and the lesser one to Ganesa, which contains a granite image 16 feet high by 10 feet broad. Beyond this is the entrance to the fort, a kind of inner city, containing the remains of four palaces, all within view of each other, built by different rajahs. The temple to Rama is distinguished by pillars of black hornblende, which form the porticos and are covered with minute mythological sculptures of the greatest elegance. There are also some columns of the same material in a building near the river at Annagoondy. The most remarkable of all the religious edifices, in respect to dimensions, elaborate workmanship, and perhaps of condition, is the group of buildings dedicated to Wittoba (an incarnation of Vishnu) near the centre of the city, which has sustained no injury from time, although partially dilapidated by the Mohammedans. They consist of the principal temple, four subordinate buildings or choultrys, and several lesser pagodas, all contained within an area of about 400 feet long by 200 feet

wide, surrounded by cells, and entered through a painted pyramidal gateway. The columns are enriched with figures of the *singh* (lion), supporting the cornice, and, like the ceiling, are covered with sculpture; but the greatest curiosity is the exhibition of the god Wittoba in an elaborately carved and delicately finished car of gilt granite, with wheels of the same material.

The site of Annagoondy, which extends about one mile and a half in length from north to south, resembles that above described, but the town seems to have been enclosed, even on the river side, by walls; the roads from the river and the country pass through three or more gateways in each approach, which was formerly a fortified defile, to the centre of the place. A small village built between two of the gateways, with stones collected from the ruins, is the only part now inhabited. In the vicinity there is a temple to Krishna, which was thoroughly repaired in 1820. One of the ruins near the river contains a specimen of a ceiling painted after the Indian manner, the colours of which are still remarkably vivid. 102.

BIJON. The native name of a heavy, close-grained, compact grey wood of Amherst, East Indies, used for house posts, rafters, etc. 71.

BIJOLLI. A village situated in the territory called Rajpootana, about ten miles north of Mynal, in the centre of some of the sites most copious in ruins (of those which date after the eleventh century) in India. It contains a castle or palace called Nochoki, five (Jain) temples to Parswanath, and three to Siva. Tod, *Annals of Rajasthan*, 4to., London, 1829, ii, 745, observes that there are "four or five other places, all within five miles of Bijolli, each having two or three temples in ruins": and besides these there are the remains at Telsooah, Jarowla, and Ambaghathi.

BILECTION, see **BALECTION**.

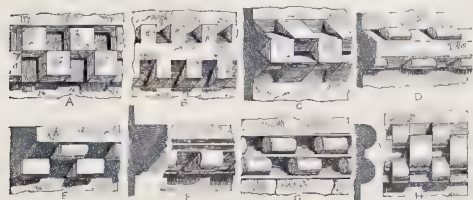
BILITALIUM FARINOSUM. A tree produced in the hills about forty miles west of Arcot, in the province of India called the Carnatic; it affords a white wood used for posts in small buildings. BUCHANAN, *Journey*, 4to., London, 1807, i, 26.

BILLANUNDY. The native name of a brown wood of Canara, East Indies, used for house building. 71.

BILLAUEDEL (....) was admitted a member of the Academy of Architecture at Paris in 1725, and died in 1762. JEAN RENÉ BILLAUEDEL, probably his son, was admitted in 1774, and died in 1786.

BILLET MOLDING. An ornament frequently found in the architectural works of the Norman period, and but rarely in that of the First Pointed period in England. Examples are also found in the Norman works in Sicily. It resembles a staff cut into short lengths, placed (generally horizontally) at intervals on some molding: sometimes two or more rows of this ornament are placed one above the other, in which case the billets of one row alternate with those of the other. There are variations in situation, such as those (if they may be called billets) placed vertically in the cloisters at Peterborough; and they are sometimes also applied on or in another ornament, as in the *billeted cable* from the Jew's house at Lincoln.

The following illustrations and description exhibit varieties of the billet with their ascribed names.



Square billet or die; S. Augustine, Canterbury, fig. A.
Embattled counter embattled billet; Arderne abbey, Normandy, n.
ARCH. PUB. SOC.

Prismatic billet; transept of Winchester cathedral, cir. 1090, c.

Segmental billet. A single row is seen on the arch of the choir at Peterborough cathedral, and at Malmesbury, r. Two rows occur at a fireplace in the castle at Newcastle-on-Tyne, cir. 1080, d. The central face occupied by a similar billet, forming three rows, is seen at the abbey aux Dames, Caen. Three rows on a flat face is seen at the abbey aux Hommes, Caen, u.

Square billet or die with segmental billet; S. Mary's church, Leicester, z.

The complete roll billet. In a double range at Bingham priory, Norfolk, o.

At Walmer, Kent, they are seen elliptic, in consequence of the hollow in which they are placed being too flat. A quadruple range occurs at Coutet les Caen, Normandy.

The GLOSSARY, *Descr. Index of Illustrations*, s. v. 'Molding', pl. 111, describes the **BEZANTS** in a molding at Canterbury, Kent, as a *flat billet*.

BILLIARD ROOM (Fr. *salle de billard*). The apartment prepared for the reception of a billiard-table, and therefore requiring to be of specific dimensions. An ordinary billiard-table is 12 feet in length and 6 feet in width, and the player using the cue requires a clear space of 6 feet on all sides of the table. The table itself is sometimes made rather longer, and frequently shorter, but the width is always half the length. The upper edge of the cushion of the table is 3 feet, and the under side of the frame is 2 feet from the floor: the table has eight legs, four on each long side. An open fire-place is considered the best mode of warming. Rapid means of ventilation are essential. Daylight is best admitted from a lantern with slightly sloping sides. Although four artificial lights are often used, three placed in a line lengthwise are considered better, the top of the burners being 3 feet above the table, and the distance between them regulated by the mark of the balk lines, which are 8 feet 4 inches apart in an average-sized table. Woodwork is considered the best finish to the walls, at least for a height of 7 feet. A *banquette* or step, 12 inches high surrounds the room, on which seats, 2 feet high to the top of the cushions, are placed against the walls, but whenever it may be necessary to confine the room to the smallest dimensions, fixed seats or couches should not be introduced. The other accessories of the room are one or more cue racks, each 4 feet 4 inches high, for the standing cues; and one for maces etc., with hooks about 4 feet apart on a board 9 feet or 10 feet in length and 18 inches wide; marking boards, which are about 3 feet long by 8 inches wide, and 1 foot 7 inches long by 8 inches wide, and 12 inches wide by 1 foot 8 inches high; framed slates, each 2 feet high by 1 foot 8 inches wide; and frames for the rules of the game. The usual conveniences of a dressing room should be provided in another room. In private houses it is sometimes necessary to supply a place to contain "leaves" to form a cover to the table when not in use.

BILU. The native name of *SWEITENIA chloroxylon*.

BIN or **BINN**. A term derived from the Saxon word *binne*, a manger, etc., and formerly applied to a temporary enclosure or repository made of boards, wicker, or other work, to contain grain, hops, and similar matters; its use is now, however, almost restricted to places where CORN, DUST, or WINE, are deposited.

BINAGO (L. PADRE LORENZO), called **BIFFI**, a Barnabite monk, was appointed about the year 1600 one of the architects to the cathedral at Milan, and designed in 1602 the parish church of S. Alessandro in the same city, illustrated in the *Raccolta dell' Intorno*, etc., fol., Milan, 1823. 27.

BINASCO (ZANELLO DA) was one of the thirteen architects who met at Milan 1 May 1392, to give their opinion on the designs submitted for the cathedral by Heinrich Ahrler of Gmunden. GIULINI, *Memorie*, 4to., Milan (1760-71), xi, 450.

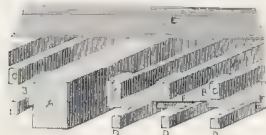
BINCHE (ARNOLF DE), probably born at Binche in Hainault, began 12 March 1234 the building of the Pamela kirche at Oudenarde, according to the inscription given in the *Mes-sager des Sciences*, 1825, p. 438.

BINDER. The short term for a binding beam, joist, or rafter.

BINDING BEAM. The main timber, *B*, of *double flooring*, being the great beam performing the office of a girder which carries the bridging joists above and the ceiling joists below it, and rests upon walls, pillars, or breastsummers.



BINDING JOIST. The name given to the secondary beam in *double framed flooring*, wherein the binders or binding joists, *B*,



are themselves supported by girders, *A*, and carry the bridging, *C*, and ceiling joists, *D*. The term is also given to the joists into which the trimmers are framed for staircases (or

well-holes for the stairs) and for chimney-ways in old times, but now for brick trimming arches.

BINDING RAFTER. A name sometimes applied to a purlin carrying rafters or slab boarding.

BINDON (FRANCIS), a native of Ireland who had visited Italy, and practised painting and architecture, built about 1744 Bessborough House in the county of Kilkenny. He died in 1765. NEALE, *Views*, 4to., London, 1823, vi.

BINDRABUND. A town on the west bank of the river Jumna in the province of Agra in Hindostan. The ancient name is Vrindavana, signifying a grove of tulsi trees, celebrated as the scene of the early exploits of Krishna, to whom the numerous temples here existing are dedicated. Some of them are remarkable for their style, and the great cruciform pagoda is considered to be one of the most elaborate and massive works of Brahminical superstition. DANIELL, *Oriental Scenery*, fol., London, 1795, pl. 2.

BING. A term used in Cumberland for a quantity of lead weighing 8 cwt.

BINGHAM (ROBERT), canon and bishop (1229) of Salisbury, continued zealously the building of the cathedral commenced by bishop Poore, and the church of S. Thomas in that city, and Harnham bridge. He died 3 Nov. 1246. BRITTON, *History*, etc., 4to., Lond., 1814, p. 28.

BINNIE STONE. A fine sandstone of a brownish grey colour quarried at Uphall and elsewhere in Linlithgowshire, in beds varying in thickness from 14 feet to 18 feet; it is extensively used in Edinburgh and Glasgow. REPORT, etc., OF THE COMMISSION ON *Building Stones*, 4to., London, 1845.

BINTANGA or BINTANGOR. The native name of a tree growing in abundance near Singapore, the timber of which much resembles red pine. It is easily cut, but is not durable, though it is largely exported by the Chinese to the Mauritius, Java, and California, both in balk and sawn into planks. EARL, *Eastern Seas*, 8vo., London, 1837, p. 414.

BIPEDA. The ancient name for a brick two Roman feet in length, one foot in width, and four inches thick, used as a foundation for the concrete of threshing floors; as the paving of furnaces in the hypocausts of baths; and as the covering of the same, they being carried on brick piers two feet high. Another use to which the bipeda seems to have been applied was for the foundation of the "ruderalio" (VITRUVIUS, vii, 1, Elzevir edit., p. 102), i.e. that beautiful pavement composed of pieces of broken marble and cement laid down like concrete beaten flat and afterwards polished, now so common in Italy, where it is sometimes called "terrazzo" or "lastrico", or more commonly "pavimento Veneziano". In this last case the joints seem to have had channels made in them as large as one's finger, and to have been jointed, as described by PALLADIUS, with hot lime slaked with oil: when used for vaulting, they were put together with iron hooks or cramps, and carefully jointed with the putty above mentioned. PALLADIUS, *De Re Rusticâ*, i, 19, 40; VITRUVIUS, v, 10; and the *Detached Essay*,

BATHS, etc., in which a full description of the processes are given.

A. A.

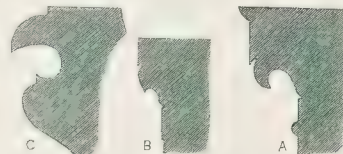
BIRCH. The English name for *BETULA*; and see *CARPINUS*.

BIRDE (WILLIAM), prior of Bath, continued the building of the abbey church, begun by bishop King, and erected a chantry chapel on the south side of the high altar. He died in 1525. BRITTON, *History*, etc., of *Bath Abbey Church*, 8vo., London, 1825; DAVIS, *Gothic Ornaments*, etc., of *Prior Birde's Oratory*, fol., London, 1834.

BIRD'S BEAK MOLDING (Fr. *bec de corbin*). A molding which in section forms an ovolo or ogee with a hollow directly under it. It is seen in classic works, and is common in buildings, furniture, etc., dating from the time of the Renaissance.

CHIN BEAK. LIP. BASIN, plate 113.

25.



A. Temple of Thetee, Athens. B. Agrigentinum. C. Fountain, Farnese Palace, Rome

BIRD'S EYE MAPLE WOOD. A light yellowish-coloured wood having darkish grey spots, which are supposed to resemble the pupils of birds' eyes: like *CURLED MAPLE*, it is produced by a variety of *ACER*.

W. H.

BIRD'S EYE PERSPECTIVE, or **BIRD'S EYE VIEW** (Fr. *vue à vol d'oiseau*, and *vue à ballon*).

A representation of any place taken from a great height, such as could only be visible (as the name imports) by the "eye of a bird when flying", or from a balloon; of course the lines can only be found geometrically. Bird's eye perspective ought to differ from ordinary perspective representations only in this, that the horizontal line must be above the objects represented (generally it is very much so), while all rules for vanishing points, etc., remain unchanged. The difficulties that have been found in this system of geometrical delineation are these—that at the extremities of the picture there is considerable *aberration*, so much so as to cause objects to become "distorted", as it is commonly called. To remedy these "distortions", a system has been recommended of inclining the plane of the picture towards the horizon. This, in fact, is not true bird's eye perspective, but another system of representation, called by the Italians *di sù in sotto*, and which is the converse of the system of "undershortening" (or dome and soffit painting) called by the Italian artists *di sotto in sù*. But this system, if carried out geometrically, would lead to more painful distortions than the other, as the apparent horizon must then become part of a conic curve, to the apex of which all perpendicular lines must tend. The ordinary system being found correct for the centre, and in fact for all parts of the picture except the extremities, several methods have been tried of "compensating the aberrations"; and one suggested and frequently used by the celebrated Gandy seems to meet most of the requirements of the case. For the geometrical investigation of this system, see *HORIZONTAL LINE*, and *PLANE OF THE PICTURE*. ISOMETRICAL PERSPECTIVE.

A. A.

BIRD'S HEAD ORNAMENT, sometimes called **BIRD'S BEAK HEAD**, and **CAT'S HEAD MOLDING**. An ornament common in Norman work, being decoration consisting of conventional heads of monsters generally terminating in a beard formed of one or more other heads, of foliage, or of beaks. HEAD.

BIRD'S MOUTH (Fr. *about en gueule*). A notch cut at the end of a piece of timber, such as a rafter, or a shore. SALLY.

BIRKENHEAD. A market town and seaport in the county of Chester, situated on the west bank of the estuary of the river Mersey opposite Liverpool. It has been built within the last few years, and owes its rise to the stimulating influences



of the modern commercial system. The growth of great towns is in general so much the result of accidental circumstances that perfect control can rarely be exercised over the arrangement of the streets, and other desirable sanitary provisions. Cases however have sometimes occurred in which an entire town has been projected, and though not immediately carried out, has continued to be enlarged in accordance with plans and structural arrangements previously determined. Such was Salisbury in the thirteenth, the new town of Edinburgh in the eighteenth, and Swindon, Crewe, and Birkenhead in the nineteenth century.

On a tongue of land jutting into the river between two small creeks (Tranmere Pool and Wallasey Pool), and called, from the timber with which it was covered, Birchen or Birken head, a Benedictine priory for sixteen monks was founded about the year 1153. It does not appear ever to have been very large or magnificent, though altered from time to time: the chapter house covered with Norman groined vaulting, a crypt in the Early Pointed style, and the refectory, much dilapidated, having something of a Geometrical character, constitute the bulk of the existing ruins. From the time of the destruction of the monastery at the Dissolution, the township remained in a purely agricultural condition with but few inhabitants down to the year 1818, a little before which period steam navigation had been introduced on the Mersey. The increased facilities for crossing the river, occasioned an hotel to be erected and a new ferry established; arrangements were made at the same time for laying out a portion of the land in streets; and for erecting a church, which was completed and opened in the year 1822. In 1824, Mr. William Laird, a merchant of Liverpool, purchased a large tract of land, and took steps for laying it out in a style far superior to what had been hitherto contemplated. In 1827, an additional quantity was purchased by him with Sir John Tobin; a survey was made with reference to the construction of docks, when the Corporation of Liverpool having taken the alarm, purchased the land at an enormously enhanced price. In 1833 an act of Parliament was obtained for the election of commissioners, the establishment of a public market, etc. In 1843, the project of constructing docks having been revived, a large quantity of land was repurchased from the Corporation of Liverpool for the purpose. Several dock acts have been obtained at different times, and a Joint Stock Dock and Warehouse Company, incorporated in 1845, has erected extensive ranges of warehouses communicating with the wharfs on one side, and an extension of the railway on the other. The dwellings, designed in 1846 by C. E. Lang, for the workmen engaged at the docks, are described in the *Companion to the Almanack* for 1848, p. 241.

The principal streets run from south-east to north-west, and are crossed by others at right angles. A portion of the town at the south-eastern extremity is crowded and squalid; the streets as they advance north-west become regular and spacious, the leading streets are twenty-eight yards, and the secondary ones twenty yards in width. Conway street extends nearly two miles in a direct line, and several others are above a mile in length. Few towns are better provided with roads. The whole of the land within the limits of the township is laid out as building land, the streets formed, sewered, and in great part covered with broken stone or pavement. The natural consequence of this is that houses are dotted here and there at great distances from each other as speculators may have found convenient, without much regard to neighbourhood or suitability, giving the idea of the skeleton or outline of a town to be filled up hereafter. The neighbouring quarries at Storeton Hill afford an abundant and cheap supply of sandstone, of good white colour, tolerably durable in quality, but soft and friable in texture. A large proportion of the houses in the principal streets are faced with stone; of late years a little variety has been infused into the designs, but the model of the earlier erections appears to have been Hamilton Square, the architectural centre and ornament of Birkenhead. It was designed by

ARCH. PUB. SOC.

Gillespie Graham in the year 1825, and commenced soon after by Mr. Laird. After remaining many years incomplete, its buildings were resumed on a somewhat reduced scale, and it was finally completed about 1845. The general effect is simple and bold, though somewhat heavy and monotonous. The area is about 190 yards long by 170 yards wide.

Of the public buildings, the churches are the most worthy of notice. S. Mary's (Gothic), erected near the site of the old priory church, was built in 1821 from the designs of the late Thomas Rickman; it has a roof in a single span with a western tower and spire: the body of the church has since been enlarged by the addition of a transept. Trinity church, Price Street, was designed by Messrs. Cunningham and Holme in 1837; it is in the Norman style with a square tower at the west end. S. John's church, Grange Road, was built in 1846 from the designs of Charles Verelst; it consists of a nave and aisles, with a transept at the east end, a western tower and a broach spire; the style is Early Pointed; internally it has an open timber roof. S. Ann's church was built in 1846, William Cole, architect. It is fourteenth century Gothic, with transepts and a western tower and spire. S. James's church, designed by C. E. Lang, still remains incomplete; it is Gothic, built of white stone, the rest of the churches, except Trinity, being of red. Christ's church, Oxtan Road, a Gothic structure designed by R. W. Jeppard, is a cross church, with a western tower and a broach spire. The Roman Catholic church is built in the Italian style; the site is purchased for the erection of a cathedral from the designs of the late A. W. Pugin. The United Presbyterian church is a Gothic structure, possessing some novelties in design; Walter Scott, architect. Near it a Unitarian chapel was erected in 1853 by Messrs. Hornblower and Boulton. There are also chapels for the various bodies of Methodists, Independents, etc.

A large covered market was erected in 1845 by Messrs. Fox, Henderson and Co., 431 feet in length by 131 in breadth, divided into three aisles, covered with a wrought iron roof, at a total cost of about £30,000; *ILLUSTRATED LONDON NEWS*, x. The magistrates' offices and appurtenances were erected in 1840, from designs in the Grecian style by Mr. Rampling; the front elevation is of Storeton stone.

Soon after the formation of an executive body at Birkenhead, steps were taken to provide for the health and recreation of the inhabitants by the establishment of a public park. An act was procured in the year 1843, a central site was chosen, and two hundred and twenty-five acres of land purchased. The park was laid out and planted under the superintendence of Mr. (now Sir Joseph) Paxton, and opened 5th April 1847; *ILLUSTRATED LONDON NEWS*, x. About one hundred acres of land between the inner and outer inclosures is reserved for the erection of villas, a number of which have already been built. The lodges and entrances are designed in various styles. Beyond the park a number of handsome villas have been recently erected in the district of Cloughton, and Cloughton Manor house on the hill above has been built for W. Jackson, Esq., M.P., from designs by Charles Verelst. In another part of Cloughton, S. Aidan's (Church of England) college, which has recently been commenced, promises to add to the architectural beauty of the neighbourhood.

Negotiations now (1855) in progress may possibly result in bringing the docks and wharves along the whole margin of the Mersey on both sides under one management, which will no doubt prove highly beneficial to the welfare of Birkenhead. WEBSTER, *The Port and Docks of Birkenhead*, London, 1848; *CIVIL ENGINEER Journal*, viii, 257.

J. A. P.

BIRMINGHAM. One of the largest manufacturing towns of England, and situated in the north-west extremity of the county of Warwick. It stands on slightly elevated ground, having an ascent on all sides but the north-west, thus affording great facilities for drainage. The lower part consists chiefly of old houses, none of them earlier than the half timbered houses

of the sixteenth and seventeenth centuries, placed in winding streets; the upper part contains a number of new, broad, and regular streets, the houses being well built, chiefly of red brick, those more recently erected being frequently faced with cement. An act for the supply of water was passed in 1826. The canals, which were commenced from 1767, and the railways, the first of which was surveyed in 1830, have contributed to the rise of the town to its present commercial prosperity. Of the railways it is only necessary to mention the offices in Curzon Street (Grecian Ionic) erected of Darley Dale stone in 1838 from designs by P. Hardwick, R.A., of London; and the Central station in New Street, erected 1853-54, the principal feature of which is the roof constructed by Messrs. Fox and Henderson, at a cost of about £35,000. The area, 840 feet long by 197 feet at one end enlarging to 212 feet at the other, is covered in with corrugated sheet iron and glass, supported by 36 iron principals in one span. The total weight of wrought and cast iron in the roof and pillars is 1,050 tons, and that of the glass 115 tons. The offices and hotel were designed by J. Livock of London. The only public monument in the town, a bronze statue to Nelson by Sir R. Westmacott, R.A., was erected in 1809, and cost altogether £3,000.

In connexion with the Church of England there are twenty-five churches and chapels, the most interesting of which are the following: the old parish church of S. Martin (Decorated period), the piers and arches of the nave now only remain of the original structure; the body was cased with brick about 1692, and further alterations made about 1780; three interesting monuments still exist; the tower is now (1855) being recased after designs by Messrs. Hardwick of London. Edgbaston parish church has a low tower of the time of Henry VI, the other portions have been rebuilt at various times. S. Philip's church (Roman Doric), was designed by Thomas Archer in 1711, consecrated in 1715, and finished in 1719; the urns on the balustrade were added about 1756, but have been lately removed; it was repaired in 1845; its size is 140 feet long by 75 feet wide, and it holds 2,000 persons, having been repewed in 1845. S. George's church (Decorated period) was designed by Thomas Rickman, 1820-2, and cost £12,735; its size is 98 feet long, 60 feet wide, 45 feet high, and holds 1,959 persons. Holy Trinity chapel, Bordesley (Perpendicular period), designed by Francis Goodwin of London 1820-3, is of Bath stone, and cost £14,235; its size is 90 feet long, 60 feet wide, 45 feet high, and holds 1,821 persons, the same architect also erected the spire of S. Paul's church in the same year. The parsonage and schools (Tudor period) in connexion with the chapel, were erected 1850-54 by G. Drury and J. Bateman at a cost of £2,000. S. Peter's church (Grecian Doric) built by T. Rickman and H. Hutchinson, 1825-7, cost £13,000; its size is 100 feet 6 inches long, 60 feet wide, and holds 1,903 persons; the large stones employed (one in the architrave being 13 feet long) were obtained from quarries at Guyting in Gloucestershire; the interior, destroyed by fire 24 January 1831, was refitted in 1834. S. Thomas's church (Grecian Ionic) was erected by the same architects, 1826-9, and cost £14,222; it is 130 feet long, 60 feet wide, 38 feet high, and holds 2,125 persons. All Saints church (Early English period) was erected 1833 of brick and stone from designs by T. Rickman at a cost of £3,817, and holds 1,200 persons. Bishop Ryder's church (Tudor period), by T. Rickman and R. C. Hussey, was erected 1838 at a cost of £4,500. S. George's chapel, Calthorpe Street (Early English period) was erected 1836-8 by J. J. Scoles of London; it holds 1,000 persons and cost £5,000.*

The later churches, each erected for 1,000 persons and each costing about £3,200, are S. Matthew's (Early Decorated), designed by William Thomas of Leamington, 1839-40, brick with dressings of Wooley Castle stone obtained from quarries about four miles west of Birmingham; S. Mark's (Early English), built by G. G. Scott and W. Moffatt of London 1840-1, also of Wooley Castle stone; S. Luke's (Norman), built by

the late H. Eginton of Worcester, 1841-2; S. Stephen's (Early Decorated), built by the late R. C. Carpenter of London, 1844; S. Andrew's, Bordesley (Early Decorated), by the same architect, 1845-6, in red sandstone, at a cost of about £4,000; S. Jude's (Early Decorated), by C. W. Orford, 1850-1; S. James, Edgbaston (Decorated period), by S. S. Teulon of London, 1851-52, is 96 feet long by 31 feet wide, and holds 800 persons; it is of stone and has a tower and spire 104 feet high; the dwelling (Italian) for the Fathers of the Oratory, designed by Mr. Flanagan of Blackburn, has been lately built with a temporary church attached; S. John's, Monument Lane, by S. S. Teulon, was erected 1854.

There are about fifty other places of public worship, the one most deserving of notice is the Roman Catholic cathedral of S. Chad (Decorated period), consecrated in 1841, and cost £16,000 exclusive of fittings. It is 240 feet long, 70 feet wide and 57 feet high, and is constructed of red brick with stone dressings, from designs by A. W. Pugin. The Presbytery adjoining was erected by the same architect in 1842, and cost £3,000.

The General cemetery opened in 1836, occupies twelve acres, six of which only are at present used; the chapel (Grecian Doric) was designed by Charles Edge. The Church of England cemetery consists of sixteen acres, nine of which were enclosed and laid out, and the chapel and cloisters (Perpendicular period) erected by J. Hamilton, of Gloucester, 1846-8; the cloisters are 150 feet long.

The most conspicuous and attractive of the public buildings is the Town-hall (Roman Corinthian), erected 1832-5 by Joseph Hansom and T. Welch; the total expense was £31,000. The size externally is 195 feet long by 102 feet wide and 83 feet high to the top of the pediment of the octastyle portico. The outer walls are built of brick faced with Anglesea grey marble; the portico, imitating a peripteral temple, with fifteen columns on each flank, consists of forty-four fluted columns (an additional inner column being placed at each side of the recess), after those of the temple of Jupiter Stator at Rome, each 3 feet 6 inches in diameter and 36 feet high, standing on a rustic arcaded basement 23 feet high. The large hall is 140 feet long, 65 feet wide, and 65 feet high, and exclusive of 300 in the orchestra, will contain 2,140 persons sitting, or about 5,000 standing; of these numbers 820 and 2,000 respectively occupy the galleries. The recess for the organ with other additions were made in 1849 by C. Edge. The market hall (Grecian Doric), erected 1833, by C. Edge, being 365 feet long and 108 feet wide, is one of the most spacious in the kingdom, and is well arranged, with vaults beneath for storing goods; the cost was about £30,000. Its fountain, of stone, with four bronze figures and decorations, possessing great merit, was erected by Messrs. Messengers in 1851. The corn exchange (Italian) erected 1847 at a cost of £7,000 by S. Hemming, is externally 167 feet long by 37 to 40 feet wide, containing a hall 110 feet long, 40 feet wide, and 50 feet high, covered by a semicircular glass roof. The public offices and prison, Moor Street (Roman Ionic), was built of stone in 1806, from designs by the late W. Hollins, but enlarged and improved about 1830. The borough gaol, Winson Green (Norman), erected by D. R. Hill, 1846, of brick and stone, at a cost of £50,000, encloses seven acres within its outer walls, and at present contains 320 cells. The borough lunatic asylum, Winson Green (Tudor period), designed by the same architect, 1847-8, is of brick and stone, and estimated at £45,000; it comprises two wings having five galleries in each, accommodates 350 persons, with rooms for offices, and occupies an area of fifteen acres, having eighteen airing courts, besides extensive pleasure grounds, and a suite of baths to each wing. The borough baths and washhouses, Kent Street (Elizabethan), by the same architect, 1850-51, are of brick with stone dressings, and cost about £10,000. The workhouse, Birmingham Heath (Tudor period), was erected 1852, from designs by G. Drury and J. J. Bateman, of brick and stone, and will accommodate 1,660 inmates; the cost, in-

cluding fittings, chapel, fence walls, etc., was £50,000. The parish offices, Paradise Street (Italian), were erected 1853, from designs by J. J. Bateman, of brick and stone, and cost £6,000. The Waterloo rooms, now the bankruptcy and county courts (Italian), were erected 1840, from designs by J. L. Hornblower.

Of the charitable institutions, those most worthy of notice are the general hospital, a large plain brick building, commenced in 1766, but not completed until 1779, at a cost of £7,137; the wings were added 1790-1, and cost £3,016; the dispensary, erected 1808, cost £3,000; it consists altogether of fourteen wards, in which are 165 beds. The Queen's hospital (Italian), designed by J. J. Bateman and G. Drury, 1840-1, for 80 persons, and enlarged 1845-6, by the addition of eight fever wards for 70 patients; the entire cost was £6,000. The dispensary, Union Street, erected 1806-8 of stone, from designs by the late W. Hollins. The asylum for the blind, Edgbaston (Elizabethan), 1851-2, of red brick and stone, cost £6,500, from plans prepared by S. Hemming, the front elevation being designed by Messrs. Coe and Goodwin of London.

Amongst the educational establishments the much admired free grammar school (Tudor period) founded by king Edward VI, was rebuilt 1832-4, from designs by Mr. (now Sir Charles) Barry, R.A., at a cost of about £50,000. The facing of the building is of gritstone from Darley Dale in Derbyshire. The entire plan forms a quadrangular figure 174 feet in front, and 125 feet deep, and is 60 feet high. The library is 102 feet long, 25 feet wide, 31 feet high; and the grammar school is 120 feet long, 30 feet wide, and 45 feet high, with a richly carved roof. It accommodates 465 pupils, whilst the four branch establishments will contain 970 more. Queen's college (Tudor period) was founded 1828, and erected 1850-55, by J. J. Bateman and G. Drury, at a cost of £10,000. A department of architecture and civil engineering is entitled to give diplomas. The blue coat school is a large plain stone building, erected 1724, considerably enlarged 1794 for 300 children, and again in 1854. The proprietary school (Elizabethan), of brick and stone, was erected 1841 from the designs of Hugh Smith.

The old library, Union-street, was erected 1798, from designs by the late W. Hollins, and enlarged 1845 by D. R. Hill; it contains 30,000 volumes; a circular reading room is lighted by a lantern in the centre of a domed ceiling, which is supported by twelve painted Ionic columns. The new library, Temple Row West (Italian), by S. Whitwell of London, was erected 1821. The news room, Bennett's Hill (Grecian Ionic), was erected 1825 by T. Rickman and H. Hutchinson. The society of arts, New-street, erected 1828, by the same architects, is now the school of design, it has a tetrastyle Corinthian portico of stone; the interior comprises a suite of exhibition rooms; the two principal apartments are circular, the larger one being 52 feet diameter, and lighted from the centre. The atheneum, Temple-street (Grecian Doric), by the late W. Hollins, in which modern works of art are annually exhibited, is now occupied by the Birmingham Society of Artists. The theatre, New-street, having been burnt down for the second time in 1820, was rebuilt by the late S. Beazley of London; the stone façade, designed by George Sanders of London, but erroneously attributed to J. Harrison of Chester, is of the date of 1780. The bank of the Birmingham Banking Company, Bennett's Hill, erected 1831, of Bath stone, from designs by T. Rickman and H. Hutchinson, has a portico the full height of the building to each front, one tetrastyle and the others hexastyle, and of the Corinthian order after the temple of Vesta at Tivoli.

There are barracks for infantry and for cavalry; the latter, situate in Great Brook-street, Ashted, erected 1793, at a cost of £13,000, accommodates 162 men and horses.

The buildings in the immediate neighbourhood of Birmingham most worthy of notice are S. Mary's church, Handsworth (Decorated period), containing some interesting modern monuments; S. Mary's convent, Handsworth, the buildings adjoining, and the church erected 1847 (Decorated period), were de-

signed by A. W. Pugin 1841, and cost altogether £8,000; Aston church (Decorated period), with its mediæval monuments; Aston hall (Elizabethan); Castle Bromwich hall (Elizabethan); Worcester diocesan training college, Saltley (Decorated period), erected 1851, from designs by B. Ferrey of London; S. Mary's college, Oscott, at Erdington (Tudor period), belonging to the Roman Catholics, was erected 1835 by the late Joseph Potter of Lichfield, and subsequently embellished from designs by the late A. W. Pugin; it is of brick with stone quoins; the chief front is 150 feet long, and the college has accommodation for 150 students; the chapel is 122 feet long by 33 feet wide; and S. Thomas's Roman Catholic church, Erdington (Decorated period), erected 1849, from designs by C. Hansom.

A plan of the town, which is inferior in general aspect to other places with the same population, is given in No. 166 of the *Maps* of the Society for the Diffusion of Useful Knowledge; HUTTON, *A History of Birmingham, with considerable Additions* by JAMES GUEST, 6th edit., 8vo., London, 1835; *A Pictorial Guide to Birmingham*, published by Josiah Allen, 8vo., Birmingham, 1852; W. H. SMITH, *Birmingham and its Vicinity*, etc., 8vo., London, 1836; LONDON, *Architectural Magazine*, iii and v; THE COMPANION TO THE ALMANAC for the years 1834 to 1839, and 1849; ILLUSTRATED LONDON NEWS, iii, 141, 381, ix, 137, xvii, 296.

BISACCHERI (CARLO), see BIZZACCHERI.

BISACCHINO MARBLE is much used for decoration in Italy and France. It is obtained in Sicily; and though sometimes procured of a green colour, it is also found milk white, and white with green veins. A marble of this kind is found in Tuscany, and receives the same appellation. It has been much used in Pietra dura work, the fineness of the grain admitting of a sharp arris; but although it receives a good polish, it is injured by heat and smoke, both in texture and colour. W. H.

BISACCIA. A city in the province of Principato Ultra, in the kingdom of Naples. It has a church, under the invocation of the Nativity of the Virgin, which was the cathedral of a bishop until 1513-22; several other churches, and a Franciscan monastery. 75. 96.

BISARCHIO. A city in Sardinia. It contains a cathedral church under the invocation of the Conception of the Virgin, a Capuchin convent and monastery, a *seminario*, and an hospital. 75. 96.

BISCARI, see PATERNO CASTELLO (IGNAZIO VINCENZO).

BISCEGLIA or BISEGLIA (the ancient VIGILIE). A city in the province of Terra di Bari, in the kingdom of Naples. It was rebuilt, or rather restored to some degree of prosperity, by Peter count of Trani, one of the twelve Normans who conquered the south of Italy. He built the church of S. Matteo, 1074-99. The town, which is badly built, is enclosed by walls, and surrounded by pretty country houses. The cathedral, dedicated to S. Peter; two collegiate and three parish churches; with those of seven or eight monasteries and convents, are the only buildings of importance besides the *seminario* and hospital. SARNELLI, *Memorie della Città*, Naples, 1693. 75. 96.

BISCUIT. This term, used to denote once-baked works in clay, similar in colour to the inside of twice-baked bread in the form called biscuit, was formerly restricted to articles made with the finest clays, but it is now applied to a particular composition or its variations called *Carrara*, *Parian*, or *Statuary* porcelain, as well as to commoner clays. The beauty, durability, and facility in the working of biscuit ware, with its comparative cheapness, render it useful to architects, and attempts have consequently been made during several years to introduce it for the purposes of decoration. As biscuit has no glaze (which would require a second baking), it is permeable by water, which however produces no alteration in its texture or form: the baking-heat is greater than that required for a glaze. W. H.

BISE, now written BICE.

BISELLIUM. The Latin name for a bench or seat, used in the provinces in the same manner as the *sella curulis* at

Rome. Though large enough, as its name imports (VARRO, *L. L.*, iv, 8), to accommodate two persons, a single footstool only is shown placed in the centre in the two sculptured representations, showing a fringed covering, discovered at Pompeii, where two bronze bisellia were also found, one of which is inlaid with silver; MUSEO BORBONICO, ii, 31; where BECHII seems to incline to the opinion that a bisellium was the customary seat of the two Duumvirs, and therefore placed for their reception in theatres and other public buildings. Bisellia are illustrated in the LIBRARY OF ENTERTAINING KNOWLEDGE, *Pompeii*, 12mo., London, 1832, i, 268, and ii, 271. A. A.

BISIGNANO (the ancient BESIDLE or BISINIANUM). A city in the province of Calabria Citra, in the kingdom of Naples. There is a castle outside the town which consists of mean houses, built in narrow and crooked but picturesque streets. The fine cathedral, under the invocation of the Assumption of the Virgin, nineteen churches, three monasteries, two hospitals, a town hall, and a *seminario*, are the only public buildings usually mentioned. The quarries produce a coarse marble besides a gritstone, which is very durable. W. H.

BISMUTH (Fr. *bismuth*; Ger. *wismuth*). A metal also known by the names of tinglass and marcasite. The native metal occurs in the primitive and floetz formations in many parts of Europe, with ores of cobalt, nickel, silver, copper, and bismuth ochre; it is also found with selenium and tellurium: it is sometimes white, and resembles antimony, but frequently has a reddish tint, and is also found variegated. When it occurs as an oxide it is called bismuth ochre; as a sulphuret, bismuth glance; as a sulphuret with copper, copper bismuth ore; and when with copper and lead, needle ore. It is brilliant, crystallizes readily, and is easily reduced to powder; in hardness it ranks between gold and silver, but is very brittle, being neither malleable nor ductile: its specific gravity is 9.83.

Bismuth easily combines with sulphur, amalgamates with mercury, and unites with all metals except perhaps zinc and arsenic; it is fusible at 476° of Fahrenheit. Twenty-four parts of tin to one of bismuth form a compound which is somewhat malleable, and is more brilliant, hard, elastic, and sonorous than tin; the addition of more bismuth renders the mixture brittle. It greatly increases the fusibility of some other metals, rendering them fitter to be used in fine castings from delicate substances: thus fusible metal consists of eight parts of bismuth, five of lead, and three of tin; this melts at 212° Fahrenheit; the addition of one part of mercury renders it still more fusible; but a compound of two of bismuth, one of lead, and one of tin, is said to melt at 200°; while five of bismuth, three of lead, and two of tin, form the composition used for stereotype plates, which melts at 199°. The solder of pewterers generally consists of one part of bismuth, one of lead, and two of tin; the proportions of that used by plumbers are one of bismuth, five of lead, and three of tin.

Pearl white (Fr. *blanc de fard*), which has also been called Spanish white, is a subnitrate of bismuth; it is employed in enamelling as a vehicle of other metallic oxides, as it increases their fusibility without adding colour. It has also been used as a pigment, but if it contains silver, as it generally does, it assumes a grey tint upon exposure to the light. Marks made on paper with nitrate of bismuth remain invisible while dry, but become visible and white by immersion in water, and black or brown by exposure to sulphuretted hydrogen.

The residuum of bismuth ores, after the metal has been extracted and any sulphur or arsenic evaporated, is called in Germany *wismuth-graupen*; which mixed with silica and potash, runs into a fine blue glassy matter equal to, and said to be in no respect different from, the zaffre or smalt produced in the same way from cobalt ores. 13.

BISNAGHUR, in Beejapore, see BIJANAGHUR.

BISNATI, see BESNATI (ALESSANDRO).

BISTRE. A durable pigment of a citrine brown colour, made from the soot of any wood, that of beech being preferred,

Scotch bistre however is the soot of peat. It was much used as a water colour before the introduction of Indian ink; as an oil pigment it dries with very great difficulty. 9.

BISUTOUN, also written BESUTUN and BESUTTOON, as if from the Persian negative *be* and *sitoun* pillars, but KEPPEL, *Personal Narrative*, 8vo., London, 1827, explains that the word should be written BEEST-SITOUN, *i.e.* twenty pillars. A village or caravanserai on the mountain of the same name, about equidistant from Sahana and Kermanshah, in the province of Irak in Persia. The spot is generally considered more interesting for its historical sculptures and inscriptions than for its architectural remains. These last, however, have been well illustrated by FLANDIN, *Voyage en Perse*, fol., Paris, 1844, planches i, 15-18, texte 7, and i, 418, who gives a plan and view of the ruins, with drawings of two capitals, described as belonging to the period of the Sassanide dynasty (A.D. 226-637); they are excellent specimens of Romanized Greek art executed under Persian influence.

BISWAH and BISWANSEH; Indian measures of length; see BIGAH.

BIT. A general name for the metal portion of several tools used for boring, and made so as to fit at one end into a socket in the handle of a BRACE or STOCK, by which they are applied with greater power and precision than GIMLETS or AUGERS, and are therefore preferred for large holes, for all cases in which accuracy is necessary, and for boring hard woods. A set of bits usually consists of thirty-six pieces of various sizes, viz. eight CENTRE BITS, used for cutting clean holes into wood across the grain; as the name imports, they have a centre pin, and on one side a cutting tool and on the other a clearing tool: six AUGER BITS, made exactly like the common AUGER, and generally used with the grain: six SHELL BITS, exactly like common GOUGES: six NOSE BITS: two RIMERS to enlarge holes in iron: two RIMERS for brass: two COUNTERSINKS to allow the heads of screws to be driven in flush: two ROSE BITS for the same purpose, but of finer construction: and two TAPER SHELL BITS to enlarge the holes made by those before described. These comprehend "the set"; but lately four of those excellent tools the MORTISE LOCK BITS are often added, which are said to have been invented by a well borer; they consist of a strong spiral square cut screw, with a cutting tool at the end, and a strong gimlet point to facilitate its entrance at the exact centre. Screw-drivers are formed to fit the socket of the stock. A. A.

A rimer bit is four sided; when a similar tool has five or more sides it is called a BROACH. The term BIT was used at the end of the last century for the cutting portion only of these tools.

The BIT of a key is the part fitted to the shank in which the wards are made; it is also called, until cut, the blank.

BIT AND BRACE, see BRACE.

BITERRÆ, the ancient name of BÉZIERS in France.

BITETTO (the ancient BISERECTUM). A city in the province of Terra di Bari, in the kingdom of Naples. It contains a fine cathedral, dedicated to S. Michele, and several monasteries. 75. 96.

BIT HAMMER. A tool which is a modification of the ACISCULUS of the ancients. It is used by masons in Cumberland and Wales for pick dressing or roughly tooling granite, limestone, and other hard stones. It consists of a hammer head, one end made square for scabbling, the other end having a socket to contain "bits" of various shapes; these soon become blunt, and being taken out for repair are replaced by others. R. R. R.

BITONTO (the ancient BRUDRUNTUM). A city in the province of Terra di Bari, in the kingdom of Naples. It contains a cathedral, said to be magnificent, dedicated to S. Valentino, several hospitals, and a *seminario*. 75. 96.

BITTER NUT WOOD. A large timber tree, see JUGLANS.

BITTI, see CAPORALI (GIAMBATTISTA).



BITUMEN. The substances usually comprehended under the name of bitumen are rather numerous; this article will however treat only of those employed in building operations, namely, naphtha, petroleum, asphaltum, and maltha.

The substances, as they occur in nature, are probably mixtures, in variable proportions, of the carburets of hydrogen with compounds of carbon, hydrogen, and oxygen, analogous to many of the fossil fuels. Some of them are soluble in alcohol, whilst others are only partially so; but ether powerfully attacks all the varieties, and any resin which it leaves is digested by the oil of turpentine, linseed, olive, and other oils. When treated by these last-named agents, a species of carbonaceous matter, or a modified bituminous substance, is left, upon which they have no influence, and which has a different point of fusion from that of the natural material.

Naphtha (Fr. *naphthe*) is a thin volatile and inflammable oil which occurs in a natural state in many recent geological formations; the finest varieties are found upon the shores of the Caspian sea; but there are springs from which it is obtained, in the duchy of Parma, in Tuscany, Calabria, Sicily, France, Spain, England, and many other countries. It is of a yellowish colour, and varies in specific gravity from 0.70 to 0.85: it is insoluble in water, but mingles with alcohol or ether in any proportion. It is used for lighting, for lubricating the bearings of wheels and axles, and for the preservation of timber, cloth, felt, cordage, etc., DIDEROT and D'ALEMBERT, *Encyclopédie*, s.v.; a use to which it is now rarely applied. Petroleum (Fr. *pétrole*) appears to be naphtha holding asphaltum or perhaps other bituminous products in solution; it is found in great abundance on the banks of the river Irawaddy in the Birman empire, as well as on the shores of the Caspian sea.

In the following article on BITUMINOUS CEMENTS or MASTICS, it will be seen that *asphaltum*, strictly speaking, means a substance essentially different from that ordinarily known by the name of *asphalte*; for the latter term is universally received as representing a mastic obtained by the use of bituminous limestones in combination with liquid bitumens.

Asphaltum, now chiefly used in the preparation of black japan varnish, and as a pigment, is principally found in the secondary or tertiary formations at the feet of volcanoes. The asphaltic lake of Judæa, a similar lake in the island of Trinidad, the asphaltic spring of Arlona in Albania, and of Coxitambo in South America, are the most remarkable and best known sources of supply. There are others in Hungary, Bavaria, and the Tyrol; but they are neither so copious, nor is the asphaltum they produce so much esteemed as that obtained from Judæa, which is known in commerce as Jewish bitumen. In its natural state asphaltum is black, occasionally tinged with brown, red, or deep green; when purified, it sometimes takes an indigo-bluish tint. It is solid, opaque, fragile, with a conchoidal fracture, and it acquires resinous electricity by friction. Its density varies between 1.040 and 1.245. At the ordinary temperature it can be pulverized; between 221° and 226° it begins to melt; and, when placed upon a substance in combustion, it burns with a long clear flame, producing some soot, and giving off a peculiar aromatic odour.

Maltha, pissasphalte (bisasphaltum, as improperly written by ZEDNER), mineral pitch (Ger. *schwarzes Schuedisches Pech*), is sometimes found in detached masses, or in veins; but generally speaking it exists in combination, or diffused through limestones, sandstones, clays, or sands. It begins to appear in the geological series in the millstone grit; it is more largely developed in the oolite formations, or the subcretaceous series; and it occurs in considerable deposits in the tertiary formations. The subcretaceous deposits of the Val de Travers in Switzerland, the cretaceous deposits of Chavaroche and Seyssel in Savoy, of Seyssel in France, of Limmer in Hanover, the sands of Bastenne and Lobsann, and the basalts of Auvergne in France, all contain maltha in sufficient quantities to furnish supplies to extensive works used for its extraction; and of late years

a considerable portion of the liquid maltha used in commerce under the name of bitumen has been obtained by the treatment of the tertiary sands of Bastenne, which is considered to be of the best description. When maltha is freed from extraneous matter it presents a mass of a brilliant black colour, tinged with yellow if any sulphur should be present: its consistency varies in proportion to the quantity of petroleum it may contain; it is soft and viscous when the specific gravity is between 0.97 and 1.00: when the gravity is about 1.04 the bitumen forms a solid matter. Its odour is similar to that of petroleum; and if thrown upon a bright fire it burns with a brilliant flame, giving off a dense white smoke. In cold weather this bitumen contracts very perceptibly: it melts at a temperature a little above 212° Fahrenheit; between 250° and 285° it begins to boil, and to give off a dense smoke. If the distillation be continued the result will be, on the one side, an oil whose properties will vary according to the nature of the bitumen employed; and on the other, a black brilliant substance, very brittle at the ordinary temperature of the air, and decomposing easily if the application of heat be continued. Hence it would appear that maltha consists of two principles, analogous to the stearine and oleine of fatty substances; and chemical authorities generally consider that it is upon the character of the oil which they contain that the successful application of this class of substances depends. Indeed coal tar, when treated in a similar manner to mineral pitch, and mixed carefully with lime or some descriptions of limestone, is susceptible of being made into a mastic closely resembling the asphaltic mastics obtained by mixing pounded bituminous limestones with melted maltha; but the volatile nature of the oil contained in the coal tar causes the latter to lose rapidly its powers of cohesion. By distillation this volatile oil can be expelled; and if a new and more fixed oil be introduced in its place, the coal tar mastics may be considerably improved. In their ordinary condition they are not capable of resisting the variations of atmospheric temperature.

G. R. B.

BITUMINOUS CEMENTS or MASTICS. In the year 1712, M. d'Eryns of Berne discovered the asphaltic limestone of the Val de Travers, in the canton of Neuchâtel, and called attention to the uses to which it might be applied. It was not until about the year 1837, however, that the real merits of this class of materials were fairly brought before the public, when unfortunately a number of speculative companies were immediately formed in England and on the continent, to work anything in the shape of an asphalt mine. The failures which naturally ensued in consequence of the ignorance of the agents, and from the injudicious use of some spurious imitations, have given rise to a strong prejudice in the minds of many persons against the use of the materials themselves; but experience has proved that bituminous mastics or asphaltes are of great value, inasmuch as they combine the qualities of fusibility and adhesiveness, plasticity and tenacity; while asphalt in many cases forms a good substitute for flag paving, and from its capability of receiving colour by mixture with coloured sands or other materials, it becomes a valuable means of decoration. It is important, however, to recollect that at the temperature of 130° most asphaltes begin to soften, and that they shrink and swell to a considerable extent. METALLIC LAVA.

The bituminous materials employed in building operations in the north-west of Europe, are obtained principally from the Val de Travers, in the canton of Neuchâtel in Switzerland; from Scyssel, in the department of the Ain, and from Lobsann or Lobsen, in the department of the Bas Rhin, in France. The materials in the two former cases are found in a bituminous limestone; in the latter, in bituminous sands, as is also the case at Bastenne, in the department of the Landes in France.

In the preparation of asphaltic mastics, two operations are performed; the first consists in pulverising the bituminous limestone, the second in mixing such proportions of mineral pitch as shall produce a substance consisting of from fourteen

to sixteen parts of bitumen to from eighty-four to eighty-six of bituminous limestone. The larger proportions of bitumen are required when it is desired to impart great elasticity to the mastic, or when it is to be used as a cement; the smaller proportions are adopted when it is desired to obtain a hard durable surface. The pulverization should be effected when the rock is cold, and the dust passed through a sieve of ten holes to the square inch. Generally speaking, also, it is advisable to mix this powder with the bitumen before the sand is added; but whether the materials are exposed or not to this double melting, it is important that they should not be subjected to such a degree of heat as to drive off any of the oils they may contain. In practice it is found preferable to mix the liquid bitumen obtained by the treatment of the sands with the powdered limestone, in order to give it the requisite degree of plasticity; but both the Val de Travers and the Seyssel rocks yield a bitumen, which is quite admissible when the Lobsann or the Bastenne bitumen cannot be obtained.

When asphalt is used for footpaths, a chief condition of its success is that the substratum should be dressed off to a regular inclination, and be incompressible. It is also necessary to prevent any moisture accumulating below the asphalt, for should it become ice, expansion would destroy the surface of the pathway. In Paris it is customary to place a layer of hydraulic lime concrete, at least four inches thick, below the asphalt, and the upper surface of the concrete is rendered with a coat of finer mortar: both these layers are allowed to dry thoroughly before the asphalt is applied. The mastic so called, composed, as said above, of from fourteen to sixteen parts in volume of liquid mineral pitch to from eighty-four to eighty-six of bituminous limestone (which itself usually contains about 12 per cent. of bitumen to 88 per cent. of carbonate of lime) is then mixed with sharp and rather coarse sand, in the proportions of five of the mastic to three of the sand, and applied in bands of about 2 feet 6 inches wide. Sand is sprinkled over the finished face of the work. The thickness usually given varies from one-half to five-eighths of an inch; but in the latter case rather less sand should be used. When asphalt is applied to form the exposed surface of wooden bridges or of terraces, means must be adopted to prevent the variations of the dimensions of the woodwork from affecting the bearing surface, and it is preferable to execute such works in two thicknesses of the asphalt, of rather less dimensions than for ordinary paths.

Some successful applications of this material have been made for paving stables, and indeed it possesses many advantages in such positions. Ordinary stone, brick, or wood pavements retain considerable quantities of the urine of the animals stalled upon them, and therefore must give off ammoniacal vapours injurious to their health. The mode in which the military engineers of France have executed some asphalt floors for the stables of their cavalry is as follows. A layer of concrete, composed of four parts of liquid bitumen, forty parts of mastic, and sixty parts of gravel, about one inch thick, is laid upon a carefully prepared bed, and dressed off to the proper fall. Upon this layer a coating of asphalt of the same description as that used for footpaths is laid, with a thickness of five-eighths of an inch. Before this has time to cool, it is rolled with a heavy cast iron roller, grooved in such a way as to leave a slight foothold for the horses, but not to prevent any liquid flowing into the drains.

In applying asphalt as a covering to the extrados of arches no sand should be used, and the thickness should be made at least five-eighths of an inch. It is important in such situations to protect the asphalt from the sharp edges of the small stones of the ballast or metalling used for the roadway.

To render cisterns perfectly water-tight, it is advisable to cover the surface of the concrete foundations with a layer of asphalt of a similar composition and thickness to that recommended for terraces. The enclosure wall, to resist the thrust of the ground, should be built upon this layer in good impermeable masonry; and a false lining of one brick in thickness

should be carried up, so as to leave a space of about half an inch between it and the outside wall. The lining should be executed with very clean hard-burnt bricks, set in pure asphaltic mastic; and at every two courses in height, the space between the two walls should be filled in with tolerably liquid asphalt pressed down very close. When the wall is carried up to its full height, a rendering coat of this material, about a quarter of an inch thick, should be worked upon the inner face of the cistern. Great care must be taken to ensure its adhesion to the wall, and to prevent any infiltration between the rendering coat and the brick lining. Asphalt might also be advantageously applied in the execution of masonry in situations where land springs are likely to wash away other descriptions of cement. LES ANNALES DES MINES, 1838-39; LES ANNALES DES PONTS ET CHAUSSEES, 1850; HUGUENET, *Asphaltes et Naphthes*, 8vo., Paris, 1852; SIMS, *Practical Observations on the Asphaltic Mastic of Seyssel*, 8vo., London, 1838.

G. R. B.

BIVIMUM. The Latin name for each of two roads which meet at an angle; PLINY, *H. N.*, vi, 32. The word seems also to have been used for the plot of ground at the junction of the two roads, which at Pompeii is always furnished with a fountain. The French language has availed itself of two somewhat similar terms, namely, *bicoie* for the plot, *a*, between the roads, and *biviaire* for the place, *b*, in which the roads meet.

5.

BIZARRE. A French word adopted by English critics to express the effect of innovations which a sound judgment would condemn in design, execution, or decoration. *Bizarrie* avows a contempt for precedent, and exhibits singularity as well as originality. Barozzi is generally cited as an example of CAPRICE, Borromini of the bizarre, and Guarini with his followers of the BAROQUE and ROCOCO.

25.

BIZZACCHERI (CARLO), a pupil of Carlo Fontana (1634-1714), modernized the palazzo Negroni, and built that called S. Luigi dei Francesi at Rome.

3.

BLACK (It. *nero*; Sp. *negro*; Fr. *noir*; Ger. *schwarz*). The ancient materials forming black, *ATRAMENTUM*, consisted of calcined ivory, *elephantinum*; carbonized husks of grapes, *tryginon*, invented by Polygnotus of Thasos, about B.C. 463; several smoke blacks; and *kalkanthon* or *atramentum sutorium*, or blacking, a vitriolic black employed in staining wood. *Atramentum Indicum*, probably Indian ink, was esteemed the best; but its composition, being unknown, was imitated with the dregs of wine. Two mineral blacks were also employed: PLINY, *H. N.*, xxxv, 25; and also *sepia*. *Atramentum pictorium* or *tectorium*, a black powder, in whatever way it might have been prepared, was mixed with glue when used for painting, and with gum when employed for writing. COLOUR; PAINT.

The modern black pigments are also either natural or artificial; of which it may be said generally that the mineral ones dry well in oil, but are heavy and opaque, while those made by the admixture of colour do not dry well in oil, which is also the case with most other blacks which are chiefly charcoal: BLACK LAKES have also been employed. Mixed blacks are powerful in colour, although transparent, and are chiefly made by the addition of a blue, like ultramarine, cobalt, and Prussian blue in oil, and indigo in water; with red or yellow lakes in oil, and with red and yellow earths in water: Prussian blue and burnt lake form a powerful black. Some blacks are so manufactured as to curdle when mixed with other pigments, and it should be observed that vegetable or common charcoal possesses to a certain extent the power of destroying vegetable colour; but this property exists in a much higher degree in what is called animal charcoal, such as ivory black and bone black, which are the charcoals remaining (with the phosphate of lime which they contained) from the decomposition of bones by heating them in iron cylinders.

Of the first or natural sort are BLACK LEAD, MINERAL BLACK, BLACK OCHRE, and BLACK CHALK, while coal and other mineral black substances, have also been employed in place of more

perfect blacks when these could not be procured, which rarely happens; but a process for obtaining a black for printing-ink by burning common coal tar was patented by Martin and Grafton 21 October 1821, and called by them SPIRIT BLACK. The principal artificial black pigments are smoke blacks, such as LAMP BLACK and INDIAN INK: FRANKFORT or GERMAN BLACK, such as it is principally prepared for the manufacturers of printing ink, is next in intensity to them, and is more powerful than merely vegetable charcoals, such as ALMOND BLACK, BLUE BLACK, PEACH BLACK, SPANISH BLACK, and VINE BLACK; or animal charcoals, such as BONE BLACK, HART'S BLACK, and IVORY BLACK: PURPLE BLACK is more like a "blackish purple". 9.

BLACK AND GOLD MARBLE, also called PORTO VENERE, and ANTIQUE PORTOR MARBLE. A black marble veined with yellow, which is quarried at Carrara in Modena. The colours are very distinct from each other in good specimens. A modern PORTOR marble is also quarried at Carrara and at S. Maximin near Toulon in France, which is black veined with yellow and a little white.

BLACK AND WHITE WORK, see SGRAFITO.

BLACKBAND IRON-STONE. An iron-stone discovered in Scotland by Mr. David Mushet in 1801, among the coal formation. ARIGNA. W. H.

BLACKBURN (WILLIAM), born in Southwark 20 December 1750, was apprenticed to a surveyor, obtained in 1773 the silver medal of the Royal Academy, and in 1782 the premium offered by the Commissioners for Penitentiary Houses, for the best plan for such establishments. Many county gaols and other structures of the same nature were consequently built under his inspection. He died 28 October 1790. 46.

BLACK BUTT. A wood introduced from New South Wales, suitable for railway sleepers and other engineering purposes. 71.

BLACK CHALK (Fr. *schiste graphite*). The variety of bituminous schist, which is called ampeélite, contains a small quantity of carbon, and is bluish black in colour; this forms the only native black CRAYON used by artists, who term it black Italian chalk (Fr. *pierre d'Italie*); but bluish and greyish argillaceous schists, such as are found in anthracite beds, are used by masons and carpenters, and are called black chalks. The Conté crayons, improperly called black chalks, as invented by Conté in 1795 are clay mixed with a black colouring matter. 40.

There is also a clay of a bluish black colour, which is extremely soft; it owes this last quality to the presence of about 12 per cent. of carbon, and this has been called black chalk. 9.

BLACK EBONY WOOD, see DIOSPYRUS.

BLACK GREENHEART, see GREENHEART.

BLACK GUM TREE. A timber of North America, see NYSSA.

BLACKHEART. The name of a soft and not heavy wood from the river Demerara, British Guiana; it is useful for house frames and for furniture: it works from 6 inches to 7 inches square, and is from 20 feet to 30 feet long. 71.

BLACK JACK. The name given to a native sulphuret of zinc.

BLACK LAKE. A LAKE which has been burnt in order to produce a BLACK pigment.

BLACK LEAD, otherwise called PLUMBAGO and GRAPHITE.

Not a single particle of lead enters into the composition of the substance called black lead, which is a variety of mineral carbon, and is sometimes almost pure; it generally contains variable quantities (sometimes so little as 0.05 per cent.) of the oxides of iron and manganese, in combination probably with titanate oxide. It is dark steel-greyish black in colour, with a metallic lustre, and is easily reduced to an impalpable and greasy, but only slightly adherent, powder. This last quality renders it useful for the manufacture of drawing pencils, as well

as for giving a lustrous surface to iron-work; but its most important application to architectural purposes is its power in counteracting friction between metallic surfaces, as in the case of iron beams and their beds. Although not generally employed as a pigment, FIELD, *Chromatography*, &c., London, 1835, p. 182, claims a place for it "at least among water colours; in which way, levigated with gum water in the ordinary manner, it may be used effectually with rapidity and freedom in the shading and finishing of pencil drawings, &c.; and as a substitute therein for Indian ink. Even in oil it may be useful occasionally, as it possesses remarkably the property of covering, forms grey tints, dries quickly, injures no colour chemically, and endures for ever." It is also used in the manufacture of crucibles, and in the preparation of molds for fine sand-casting: for which purposes a sort of anthracite found near Ayr in Scotland is frequently substituted. W. H.

BLACK MARBLE. The marble called in commerce *Nero Antico*, and *Egyptian black*, is that most beautiful black marble without any admixture of other colours, which the Romans seem to have called *Lucullite*, or marble of Lucullus (PLINY, *H. N.*, xxxvi, 8). The Italians term it, but improperly, *paragone*; the weight of a foot cube averages 182 lbs. It appears that it is still found, mixed with an inferior black marble, at Prato in Tuscany, Carrara in Modena, Bergamo in Milan, Montmajour in the Pyrenees (Upper Garonne), Spa in Germany, and Dinant in Belgium; this last gives a marble weighing 189 lbs. per cubic foot.

The black marbles found in the British islands are fine in colour, but, like the Italian, are not easily obtainable in blocks large enough to give slabs altogether free from faults: the Kilkenny marble is the best, and is used for tesserae, chimney pieces, and banded colonnettes. In England the chief quarries of uniform colour and texture are at Ashford, Bakewell, and Derby in Derbyshire; the Wetton marble from Staffordshire is coarse; that found in the quarries at Ribblesdale, Sedbury, and the western moorlands in Yorkshire, is durable; WHITAKER, *Richmondshire*, fol., London, 1823, mentions that on a grave-stone of black marble, lying flat on the floor in the north aisle of Gilling church, are two sculptures in low relief of Henry Boynton and his wife, dated 1523; adding "of this style, which is very unusual, there are a few other specimens in Richmondshire, all indebted to the extreme hardness of the marble on which they are cut for their present state of preservation." It is said that the colour of some of the Italian and English black marbles fades under exposure to a strong light and heat from the sun. The jetty colour is produced naturally by carbon; but black marble, when calcined, produces a very white lime. The best quality in the English beds occurs from three to nineteen inches in thickness, that used for inlaying is about eight in thickness; this marble is now exported to Russia and to Italy for the decoration of churches and palaces. There is an old church at Aakirkebye, which is the finest ecclesiastical edifice in the island of Bornholm, belonging to Denmark; also the Martinengro tomb in the church of Il Santo Corpo at Brescia; and a chapel in Padua in Italy, which are all said to be built of black marble. In mediæval ecclesiastical buildings, as well as in modern churches, small columns of polished black marble have been used; and in some places black and other coloured marble pillars have been intermixed in the same cluster. French black marble from Normandy was used with lighter coloured stones in the Temple church, London, and the abbey church at Westminster. The black marble of Como is used in the cathedral of Sienna, in alternate horizontal courses with white marble. Black marble is used in the same manner in nearly all the churches of Tuscany, especially at Pisa and Pistoja, and also in the *duomo* at Genoa. In some cases it is supposed to have been used for the black ground of incised slabs. It is ornamented by etching, engraving, and inlaying, and the peculiar effect on the black surface of the marble, giving it a whitish grey colour, is produced by using white lead in powder; the

brown colour which pervades a few blackish marbles is considered by some to be a beauty. The *nero antico* is still more esteemed for the intensity of its colour, but it is scarce, and consequently expensive. **NERO-BIANCO MARBLE.**

Serpentino nero antico is a black SERPENTINE with brown spots: many quarries furnish a black marble so interspersed with fossil shells, madrapores, and encrinites, that at a little distance from the eye it has a general grey colour. W. H.

BLACK OCHRE. A soft variety of a native impure oxide of carbon, combined with iron and alluvial clay. When washed and exposed to the atmosphere it forms a black body, which may be employed as a pigment. 9.

BLACK TIN. Tin ore when dressed, stamped, and washed, ready for smelting.

BLACK TOUCH STONE, see TOUCH STONE.

BLACK WADD. A native ore of manganese, employed as a drying ingredient with pigments.

BLACK WOOD. The name applied to several woods possessing this colour.

BLACK BOTANY BAY WOOD, called also **AFRICAN BLACK WOOD**, is stated by HOLTZAPFEL, *Catalogue of Woods*, etc., 8vo., London, 1843, p. 75, as perhaps the hardest, and also the most wasteful of all the woods; of the sound pieces that are obtained, the majority are less than two inches in diameter; the fine pieces, however, exceed all other woods for eccentric turned works. The wood when fresh is of a bluish black with dark grey streaks, but soon changes to an intense jet black. It is considered particularly free from any matter causing rust. It is said to grow also in the Mauritius and Madagascar, where it is called *cocobolo prieto*; and splinters of it are used by the masons of that country as pencils for marking the lines upon their work; it makes a dark blue streak, not readily washed off by the rain.

Another **BLACK WOOD**, or black rosewood or **EBONY**, is a species of **DALBERGIA**. For the **BLACK WOOD** of Van Diemen's Land, see **ACACIA**. A **BLACK WOOD** (*heart hout*), *Gardenia Rothmannia* (?) of the Cape of Good Hope, is hard and tough, and used for waggon work; whilst another of the George district (*heart hout*), *Royena*, is also hard and tough, and used for furniture and tools. The term **BLACK EBONY** is applied to various kinds of **DIOSPYROS**. A **BLACK WOOD** of Canara, East Indies, is a very large tree, and used for furniture. 71.

BLADDER GREEN, see **SAP GREEN**.

BLADE. A word sometimes applied, as well as **BACK**, to the principal rafter of a roof. The **BLADE** of a chisel, of a knife, etc., is the metal portion which appears beyond the handle of the instrument.

BLADE PROTRACTOR. A variety of the **BEVEL**, was invented in 1847 by Mr. James Basire, and is described in the *CIVIL ENGINEER*, etc., *Journal*, x, 310, as the addition of a blade working on a centre in the arm of the **PROTRACTOR**.

BLANC D'ARGENT or silver white, called also **French white**. A white lead brought from Paris in the form of drops; it is one of the best, but is unfit for general use as a pigment in water, though good in oil or varnish.

BLANC DE ROI. A chalk white used as a pigment.

BLANC DES CARMES or **DE SENLIS**. The names given in France to five or six coats formed of lime ground to a very fine powder, and rubbed with a brush or with the hand so as to produce a gloss, which is the only merit of this sort of finishing. 40.

BLANC D'ESPAGNE or Spanish white. The words applied by chemists to a subnitrate of bismuth (Fr. *blanc de ferd*, *blanc de perle*) or pearl white; whereas the usual acceptations of the term in France, as in England, are for a carbonate of lime powdered, made into a paste with water, and dried in small blocks for use in distemper painting; which is the artificial Troy (properly Troyes) white, or *blanc d'Orleans*. **WHITING**. 40. 104.

BLANC D'ORLEANS or **DE TROYES**, commonly called **Troy white**. A calcareous earth found at Villeloup, near Troyes, and also at Cavcreau, near Orleans in France, was formerly much in request as a pigment, but has latterly been superseded by a factitious white known by the same name, and

prepared by treating levigated chalk with a weak solution of alum water; the latter is then removed by washings. A. A.

BLANC EN BOURRE. A French term for a mixture used in some parts of France instead of plaster. **LIME** and **HAIR**.

BLANK. In architecture this word is rarely employed in its general acceptation of an unfurnished space, except perhaps in the cases of a panel and a niche; but it implies that there are no openings in the parts to the name of which it is affixed. Thus a blank arcade or a blank balustrade is a range of arches or a range of balusters solidly blocked up for a portion of their depth; and a blank wall is often highly enriched with fictitious dressings, as seen in *Illustrations*, pl. xxxv. A blank door is a recess or space for a door, but filled in with plain walling, and is sometimes made a **FALSE DOOR**, by having a door, etc., within its dressings; this and a blank window similarly constructed, are employed to form features corresponding with other doors and windows, in order to obtain uniformity of decoration; but sometimes blank doorways are seen in mediæval buildings, which are supposed to have been meant as deceptions in case of attack, being always found either in the strongest parts of the wall, or where additional defences have been prepared.

BLANK. That part of a key wherein the wards are cut.

BLAST. A term in metallurgy expressing the current or air forced into furnaces used for the extraction or preparation of metals. As practically architects are only interested in the effects of blast as applied in the manufacture of iron, the following remarks are confined to that branch of the subject.

The blast used in Iron Works of the present day is wind gathered and expelled in immense volume, or under pressure by means of machines constructed for the purpose, which are driven either by the steam engine or by water power; the chief requirement being that the flow of blast should be constant, and at all times under control as regards volume or pressure. The blast at the furnaces for smelting iron in the iron districts is now usually heated by being passed through hot pipes. In founderies it is almost invariably used cold. Formerly it was believed that the coolness of the blast was an important condition for its utility; but the successful application of the hot blast in all iron producing countries, shows that the prejudice in favour of the cold blast is only partially correct. **SMEETING.**

The hot blast was introduced about twenty years since, and though at first it met with considerable opposition, the extraordinary difference in the quantity of metal obtained from the ore soon opened the eyes of manufacturers to its advantages; but as it allowed the mixture of a large quantity of cinder iron with the ore, the manufactured article became rapidly so deteriorated in quality that professional men at length objected to its use. It appears, however, that the application of this process is very desirable in cases wherein a soft and fluid metal is required: but to obtain a strong tough iron, the cold blast should be strictly insisted upon.

It is, however, to be observed that castings known under the name of Town or London castings, made from the variety of metals which find their way to London and become thus easily procurable by London founders, counteract, when these are properly and carefully mixed, any defects which may exist in the hot blast pig iron usually employed; and even a greater strength is thereby obtained. All iron is improved by a judicious mixture of various makes; thus by mixing a very rich open grained hot blast No. 1 pig iron with a close grained No. 2 or 3 cold blast, both will be improved; and this mixture, if again mixed with old broken castings, will be still further improved, on account of the greater amount of purity and solidity there is in good old cast metal. For such castings as girders, columns, wheels, or machinery, where a close, tough, strong metal is required, the best mixture is one-third cold blast pig iron, one-third hot blast pig iron, and one-third old broken castings, selected clean and free from the action of fire. No old castings that have been under the action of fire, such as chemical pots or fire bars, are fit for melting into castings.

For ornamental castings or for works *not* exposed to sudden blows, hot blast iron perfectly free from cinder appears to answer the purpose on account of its greater fluidity.

BLAY (PEDRO), born at Barcelona, built the parish church at Selva in the diocese of Tarragona, from the designs of Jaime AMIGO, the first stone of which was laid 10 November 1582. The building stands well, notwithstanding some settlements observed after the vaulting was finished and pronounced by those who were employed to survey the work, to arise from proceedings in construction and design contrary to all rules known to them, and unusual in Spain; whence it is concluded that both the contractor and artist were students of Italian masters or Italian works. Blay was nevertheless appointed successor to Bernardo Casares as *maestro-mayor* of the cathedral at Tarragona, in which he constructed the chapel and tomb of the archbishop Don Antonio Augustin, and superintended the stucco-work of the *trasagrario*, which was executed by Milanese artists. Those works were probably designed by Amigo, whose church at Ulldemolins (his native place) was built at the same time and on the same model as that at Selva, and possibly by the same contractor. To Blay himself are attributed the tombs of Terés and Cervantes Gaeta, the chapel of SS. Cosme and Damian, of S. Juan Evangelista, and of S. Fructuoso, in the same cathedral; as well as the Carmelite monastery near the chapel of S. Lorenzo; and the *patio* of the archiepiscopal palace in Tarragona. His great works were the restoration and the new front of the *casa de la Diputacion* (1597-1620) and the *creu* (1609) at Barcelona, where he died 3 July 1620. 66.

BLAZED. A tree is said to be blazed when marked in the usual way for felling, by a chip of bark being taken off; and also when partly or entirely stripped of its bark as a boundary or station mark. Where a line is cut through a wood to show where it is to be cut down, it is called a "blazed line". In Kent a piece of underwood thus marked out for cutting is said to be "washed out". A. A.

BLEIBERG MARBLE, so called from the quarries near the village of Bleiberg, in the circle of Carinthia in Austria, where it is found in a bed of common limestone above a vein of lead: it has all the fine colours of the opal, reflecting the red, blue, and green tints, on the fine grey ground of the marble; and the effect is heightened by iron pyrites, which give it a metallic lustre when polished. In internal work, and even for marquetry, it produces a fine contrast with other marbles; but in consequence of its brittleness it is not much used. W. H.

BLENDE. Sulphuret of zinc, composed when native of zinc, sulphur, and traces of iron, lead, and quartz. The several varieties are named according to their black, brown, or yellow colour. The black fibrous blende of Bohemia also contains cadmium. 104.

BLERA (the modern BIEDA). An ancient town, afterwards the seat of a bishopric (united to Toscanella and Civita Vecchia about 1093), but now a village in the States of the Church in Italy. The locality, which is about ten miles north-west of Bracciano (Sabate) and seven from Orivolo (Forum Claudii) on the Via Claudia, is described as extremely interesting by DENNIS, *Cities, etc., of Etruria*, 8vo., London, 1848, i, 17, who states that the assemblage of Etruscan sepulchres deserves much more attention than it has yet received, for without any marked peculiarities of its own, Bieda seems to unite those of many other necropoleis.

BLERA is also said to be the ancient name of GRAVINA in the kingdom of Naples. 28.

BLIND AREA. The space left round the basement of a building, so that earth retained by the area wall may not press against the main wall and communicate damp to it, is called an *AREA DRAIN*. A blind area is the name for such a space broken by cross walls, which form wells for stagnant air, and is inferior to an area drain, but better than a *DRY AREA*.

BLIND STORY. A term sometimes used in old documents to denote the triforium of a church, perhaps as opposed to

CLEAR or CLERE STORY. *ECCLESIOLOGIST Journal*, 8vo., London, 1842, ii, 79. 17.

BLOCAGE. A French term which is necessarily used in the English language, as expressing a particular sort of rough rubble work, not so good as concrete. It consists of a mass of apparently sound masonry formed by large and small pieces of stone thrown into a bed of mortar until they appear above the mortar, when more mortar is added and the operation is repeated. Such is the general character of the inside of most Romanesque thick walls, and of the large piers of the succeeding periods; when the mortar loses its binding power the mass becomes in a rolling state, and hence arises the destruction of certain buildings in England and on the continent so constructed.

BLOCK. A piece of wood in which a sheave or pulley is placed, and through which a rope passes.

Block. A term applied to objects of various materials used for different purposes, as a stem or stump of a tree or any such support (Fr. *billot*) of an anvil; or a mass of stone or marble (Fr. *bloc*) as it comes out of the quarry.

BLOCK or BLOCKING. The name given to small pieces of wood used by joiners in gluing up two pieces of stuff, to strengthen the joint. They are almost always put in internal angles, seldom over the joints of boards in the same plane, and rarely on an external angle, where they would nevertheless often be useful. The blocks are put at regular intervals at the back of the stuff, where they are out of sight when the work is fixed.

BLOCK, also by some called *HANDLE-BLOCK* (Fr. *bosse*). The name given to the small projections found on the steps of ruins at Thorius and at Egesta in Sicily, which are supposed to indicate the means by which the stones were raised, and to denote that the buildings from which they protrude were never completed; but they are found on the Parthenon and Erechtheum, on the returned sides of the die of the attic of the choragic monument of Thrasylus, and on the plinths of two columns as described by KINNARD, note to STUART and REVETT, *Antiquities of Athens*, fol., London, 1825, ii, 89; in most of which cases they seem to have been left to be carved as ornaments.

BLOCK CORNICE. A cornice used, in Italian architecture. It consists in general of a bed-mold, a range of block modillions or corbels, and a corona or a cornice finished in the usual manner. The bed-mold is sometimes almost entirely suppressed, or it is converted into a kind of architrave; but the difference between a block cornice and an architrave cornice is, that the latter shows facias only below the bed-mold. Sir W. CHAMBERS, *Civil Architecture*, fol., London, 1759, highly praises, under this name, the celebrated truss entablature designed by Vignola. He also gives several examples of block cornices in his chapter on "Profiles".

BLOCK HORSE. The name given in the eastern counties of England to a hand barrow or strong wooden frame with four handles.

BLOCKING COURSE. Masonry or brickwork placed on a cornice or tile creasing as the termination of a wall. Sir John Soane frequently made the front face of the blocking course to batter. The term is also explained in the GLOSSARY as "a course of stone or brick forming a projecting line without moldings at the base of a building", which is properly a *plinth*.

BLOCK TIN. The second quality of the tin used in commerce; it is the produce of the common ore of the veins, and is therefore less pure than *grain tin*. The term is also applied to iron plate tinned for inferior articles, and to the same composition with a thicker coat of tin, which is *planished* or polished for superior articles, and are then said to be made with the best block tin.

BLOEMART (ABRAHAM), born at Gorcum in 1564, studied at Paris, was appointed architect to the city of Amsterdam, and died in 1647. Hendrick de Keyser was his pupil. 24.

BLOIS (the Latin BLESÆ, BLESIA, and BLESUM). A city on the right bank of the Loire, in the department of Loire et Cher in France. The side of the river is planted with trees, and forms a continuous quay with a road in front of the modern portion of the town. The town and the suburb called Vienne are connected by a stone bridge of eleven arches, on the middle of which stands an obelisk about 60 feet in height, with an inscription stating that the work (1724) was the first public structure commenced in the reign of Louis XV. The chief portion of the city consists of picturesque old houses, which form irregular lanes, rarely wide enough to admit of two vehicles passing each other, and sometimes only broad enough for a barrow. These lanes run confusedly towards the cathedral on the right hand, and to the château on the left; near the former they contain broad low steps, forming flights of stairs, and are called *degrés*. Among the houses of old date, especially of the sixteenth century, those in the rue Pierre leading to the palace, and the hôtel d'Alluye (internally) are especially noticed; as well as the house of Denis du Pont (Pontanus) behind a shop 83 in the Grande Rue: this is illustrated in the *Mémoires de l'Académie des Sciences, etc., de Blois*, 12mo., 1836, ii, 254, pl. 3.

When the bishopric was erected in 1697, the parish church of S. Solemnus became the cathedral, and was dedicated to S. Louis. The existing cathedral, also called the church of the Jesuits, is said to be a work by Mansart; it was repaired between the years 1837 and 1840, as well as the fine church of S. Nicolas, in which the lower part of the side chapels belongs to the eleventh century, and the three first arches of the nave perhaps to the thirteenth; having been burnt in 1111, the rebuilding was commenced 25 April 1138, according to INKERSLEY, *Inquiry*, 8vo., London, 1850. At the end of the eighteenth century Blois contained the Benedictine abbey of S. Laumer, now the hospital, to which the above-named church (now S. Nicolas) belonged; the Augustine abbey of Bourg Moyon, now the *collège* or high school; an establishment belonging to the Jesuits, and still a *collège*; two monasteries; four convents, that which formerly belonged to the Carmelites is now a *haras* or breeding stable; an hospital; a *seminaire*; and an almshouse. The finest modern building in the town is the episcopal palace, built by the younger Gabriel; until 1825 it was the *hôtel de la préfecture*, for which a new building has been erected; there is also a handsome lunatic asylum near the cathedral, besides an *hôtel de ville*, containing the public library; a *bourse*; a theatre; a *palais de justice*, built at various periods; five convents; and six parish churches.

A very detailed account of the aqueducts and fountains is given by DESBROSSES, in the *Mémoires*, ii, pl. 1, pp. 3-30. A subterranean conduit, attributed to the Romans, and called the Pont de César, or the Arou, traverses the town.

A manuscript account with illustrations of the château of Blois, was made for the royal cabinet at Versailles; JACQUES FRANÇOIS BLONDEL, *Cours*, 8vo., Paris, 1772, ii, 342; it has been altered at so many periods, that little of the original building has remained undisturbed. The entrance, under a Gothic portal in the east front, leads through the body of that portion of the building to a picturesque courtyard. On the east side of this court a red brick front and cloisters with diagonally banded columns built in 1500 under Louis XII, is considered one of the most curious existing models of the style prevalent in France immediately before the Renaissance, which style was displayed in a similar cloistered porch on the north side, erected under François I, but destroyed before the Restoration, while the portico of the west side disappeared during the occupation by the *Génie militaire*; this west side, commenced and nearly finished by François Mansart for Gaston d'Orleans in 1638, was not completed until 1833-37, when the

château was converted into a barrack for 2,400 infantry. The chapelle S. Calais and the cloister on the south side (Louis XII) were partly destroyed during the occupation by the *Génie militaire*, when the building erected by Anne de Bretagne (under Louis XII) was converted into storerooms. The most ancient portions are the *tour de donjon* on the north side, the *salle des Etats*, divided by a range of eight columns in the middle, at the north-east corner, the *tour de Foix* or observatory of Catherine de Medicis at the south-west corner, all belonging to the thirteenth century; these, with the celebrated winding staircase in the Renaissance style, are the chief objects shown to visitors. The west front overlooks *les lices* and the river, and the *place des Jesuites* is situated on the north.

DE LA SAUSSAYE, *Description du Château de Blois*, 8 plates, *Essai sur l'Origine*, 8vo., Paris, 1833, and *Histoire du Château de Blois*, 4to., Blois, 1840; BAILLIAUD, *Album du Château de Blois restauré, et des Châteaux de Chambord, etc.*, obl. fol., Blois, 1851; LA BORDE, *Monumens de la France*, fol., Paris, 1836, pl. 221, gives the interior east side, and 222 the north side; SOMMERARD, *Atlas*, vii, 4, *Album*, iv, 5; CHAPUIS, *La France Monumentale*, several plates, and *Le Moyen Age Pittoresque*, pl. 4; ANDROUET DU CERCEAU, *Des plus excellens Bastimens de France*, fol., Paris, 1579.

BLOND (JEAN-BAPTISTE ALEXANDRE LE). The christian names of this architect are reversed by QUÉRAUD, as well as by NAGLER, and he is sometimes called ALEXANDRE BLON or ALEXANDRE LE BLOND. He was born in 1679, and was the son of an image dealer in Paris, in which city he built for the marquise de Sessac the hôtel de Clermont in the rue de Varennes, sometimes called the hôtel de Sessac; it is given by BLONDEL, *Architecture Française*, fol., Paris, 1752, i, 209, who states that it was commenced in 1708 and finished in 1714. The same author, ii, 56, illustrating the garden of the hôtel de Chaulnes in the rue d'Enfer, near the Chartreux, explains that it was only enlarged and decorated by Le Blond. The buildings are illustrated as being Le Blond's design in D'AVILER, *Cours*, 4to., Paris, 1760, p. 213, pl. 63, d-g; and the same statement has been repeated by BLONDEL himself, in his *Cours*, 8vo., Paris, 1771, iii, 31 (who says "hôtel de Clermont, now de Chaulnes"); in PATTE's *Continuation*, vi, 467; and in the *Arch. Fran.*, i, 55, where 1708 is given as the date of the building. The confusion is increased by DEZALLIER D'ARGENVILLE, *Vies*, 12mo., Paris, 1788, i, 442, who also states that part of his designs for the archiepiscopal palace at Auch was erected; and that Le Blond was also engaged at Châtillon (BLONDEL, *Cours*, iii, 98), and was celebrated as a designer of gardens and garden decorations; engravings of his works were frequently published, several are collected in one volume in the British Museum, marked 1269, i, 9. Peter the Great, when at Paris in 1716 or 1717, engaged Le Blond to superintend his works at S. Petersburg; and STAEBLIN, *Original Anecdotes*, 8vo., London, 1788, pp. 202, 311, 313, relates the advice given by Le Blond, his employment on the residences at Peterhof and Strelina, and the insult which ultimately caused his death on the 21 February (4 March) in the following year, 1719, at S. Petersburg; Pinault was his successor.

In the preface to the *Cours*, 4to., Paris, 1760, by D'AVILER, the publisher Mariette states that Le Blond undertook to revise the work for the second edition (1710) from the author's corrected copy and manuscript improvement of the *Dictionary*, and that Le Blond added much to the *Cours* (which contains three designs for mansions and two for staircases by this architect), especially on the subjects of distribution of plan, staircases, windows, chimney-pieces, and panelling. This was reprinted in 1720; but the edition of 1738 suppressed all that had been given by D'Aviler and Le Blond on chimney-pieces, piers, windows, doors, panelling, cornices, and ceilings, which was replaced by illustrations chosen by BLONDEL, as he acknowledges in his *Cours*, iv, 188, D'Aviler's plates being engraved again with corrections. These changes exhibit the

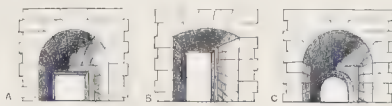
remarkable alterations in architectural fashion and taste which occurred at the beginning of the eighteenth century.

Desseins de Développement d'Assemblages, in fifty-four plates, fol., Paris, 1703; *Les Ordres d'Architecture suivant Vitruve, Scamozzi, et Vignole; and Parallèle des Cinq Ordres*, 4to., Paris, 1710, works rarely seen, have Le Blond's name as their author. The merit of the text of the work called *La Théorie et la Pratique du Jardinage* belongs to A. J. Dezallier d'Argenville, whose initials appear in the first edition, 12mo., Paris, 1709, according to QUERARD, who says that the publishers put Le Blond's name as author on the title-page to ensure a larger sale; and this is confirmed by Patte, in BLONDEL, *Cours*, vi, 465, 467, who attributes only part of the illustrations to Le Blond; thus correcting Blondel himself in the *Cours*, iv, 2, 56, 188, and in the *Architecture Française*, i, 55, as well as VIRLOYS, *Dict. s. v.*, who attributes to Le Blond two hôtels in the rue d'Enfer. Le Blond had intended to produce a complete work upon the decoration of edifices, for which more than two hundred plates had been engraved by himself and others before he left Paris for Russia; Mariette, who had written the text, disposed of the work in 1749 to Jombert, but it is not known what subsequently became of it. 60. 84.

BLONDEL (FRANÇOIS) was born at Ribemont in Picardy in 1617, or according to some authors at Paris in 1624. The *Harleian MS.* 4421, in *MUS. BRIT.*, contains "*Les plans, profils et devis de l'état des fortresses maritimes de Provence*, par F. Blondel, maréchal de bataille aux armées du Roy, et ingénieur ordinaire de la marine, 1651," dedicated to [Henri Auguste de Loménie] the comte de Brienne [Secretary of State under Louis XIV], through whom the author was employed on the fortifications of Toulon. In 1652 he was appointed tutor to the son of his patron, and having travelled with him for three years, published a Latin account of the journey. Having resided as minister at Brandenburg, he was filling the same office at Copenhagen when he was sent, through Russia, as envoy extraordinary to Constantinople in 1659: he took that opportunity of visiting Egypt. At the termination of his mission he was appointed counsellor of State, teacher of mathematics and belles lettres to the dauphin, the son of Louis XIV, and professor of mathematics in the Royal college. It was not apparently until 1665 that he engaged in architecture, in which year he was employed by the king to erect part of a bridge under difficult circumstances over the river Charente at Saintes; to this work he added a *porte* with two archways, illustrated in his *Cours*, p. 659. From this book it appears that having been commissioned in 1664 to select a site for a naval establishment, he chose the spot where Rochefort now stands, and in 1666 designed a great arsenal, but only the *corde*, some *forges*, and *magasins* (noted in the *Cours*, pp. 656-57), were carried out by him; these served, however, as models for the later erections. Soon afterwards he was sent with vessels of war and troops to inspect the state and provide for the safety of the French islands in America, from whence he returned in 1668.

In 1669 he was elected a member of the Royal Academy of Sciences, and in 1670 letters patent were issued, which directed that all public improvements in Paris should be executed in accordance with a general plan devised by him; this has been engraved in twelve large plates. He had previously in 1669 (but 1660 in *Arch. Fran.*, ii, 155) been engaged upon the enlargement and restoration of the *porte S. Antoine*, originally built by Métezeau, which was commenced in 1671, and destroyed in 1777 or 1778. He altered, or rather rebuilt from his own design (1669-74), the *porte S. Bernard*, which was destroyed between 1787 and 1792. He was one of the eight original members and the first director, as well as professor of the art, of the Academy of Architecture, founded in 1671, his colleagues being Le Vau, Bruand, Gittard (who executed the other *porte S. Antoine*), Le Pautre, Mignard, Dorbay, and Felibien. In the same year he designed the new *porte S.*

Denis, finished in 1674, which is esteemed the leading work of modern architecture in France; LEGRAND and LANDON, *Description*, 8vo., Paris, 1809, mention that Cellerier had then just commenced its restoration, which was not finished until 1850. These arches are engraved in the *Cours*, pp. 603, 614, 618; and the accompanying illustration exhibits the peculiar sort of rear vaults, which are each called *arrière-voûture de S. Antoine*, from his having designed them for that arch.



Among the points which his French biographers consider most flattering in his career, is the fact of his being allowed to compose the inscription placed on the *porte S. Martin*, erected by his pupil Bullet (1674), and on his own buildings. In 1673 he published a *Comparaison de Pindare et d'Horace*, and the *Resolution des Quatre principaux Problèmes d'Architecture*, which contains treatises on the diminution of columns by the curve of Nicomedes, and the instrument necessary for describing that line; on the curves of ramping arches; on the joints of such arches; and on the form to be given to beams intended to be of equal strength throughout the length: this was reprinted in the *Recueil, etc., de l'Académie des Sciences*, fol., 1676. In 1675 Blondel published his *Cours d'Architecture* in one folio volume; to which was prefixed his *Discours prononcé à l'ouverture de l'Académie d'Architecture*, 31 Decembre 1671. His notes to SAVOT, *L'Architecture*, appeared in 1676; the *Histoire du Calendrier Romain* in 1682; and in 1683 a corrected and augmented edition of the *Cours* in five volumes (republished in two volumes in 1698); and the *Nouvelle Manière de Fortifier les Places*, which furnishes the first portion of his biography; this and another work had been written before 1675, when they were presented to the king, who created him maréchal des camps et armées and conseiller d'état, but interdicted the publication until several fortifications then in progress were completed. The other work to which allusion has just been made was probably *L'Art de jeter les Bombes*, 4to., La Haye, 1685. The registers of the Academy state that he died 21 January 1686; BLONDEL, *L'Homme*, etc., ii, 315, and the *Cours*, vi, 468, give the date 1686, and adds "aged 68 years"; other authors say 1 February 1686; while DE FONTENAY fixes 1688, and VIRLOYS 22 January 1689, as the date of his decease. A *Cours de Mathématiques*, and four drawings of the Louvre engraved on two plates, are also attributed to him. 34.

BLONDEL (JEAN FRANÇOIS), architecte du Roi, and contrôleur de l'école militaire, was born at Rouen in 1683, and is stated in the registers of the Academy of Architecture at Paris to have been the brother of a François; he is himself sometimes called François only; Patte, in the continuation of BLONDEL, *Cours*, 8vo., Paris, 1777, vi, 468, states that he did not belong to the family of François Blondel, the subject of the preceding article. He was trésorier-général des bâtimens du Roi when he was admitted, 25 November 1707, an honorary member of the Academy of Fine Arts; he was elected in 1728 a member of the Academy of Architecture, and was 73 years of age at his death in 1756. His principal works were three villas at Genève and one at Charonne near Paris; the maison de Rouillé in the rue des Poulies (given by BLONDEL, *Architecture Française*, fol., Paris, 1752, iii, 60); the decoration of the choir of S. Jean en Grève in the rue du Martroi, since demolished with the exception of the chapelle de la Communion, erected by him, which was altered by Molinos, and afterwards attached to the hôtel de ville (LEGRAND and LANDON, *Description*, 8vo., Paris, 1809, ii, 154; it is given by BLONDEL, *Arch. Fran.*, ii, 114); the baldaquin and chapelle de la Vierge in the parish church of S. Laurent (LEGRAND, i, 169, VIRLOYS, *Dict. s. n.*), or of S. Sauveur (BLONDEL, *Arch. Fran.*, ii, 114, *Cours*, vi, 468),

all at Paris; and the hôtel des Gardes du Corps at Versailles. That he was also a good engraver is shown by several plates contributed to the *Architecture Française*, and specified in that work, ii, 115. The plates of the *Description des Fêtes données par la Ville de Paris*, etc., 1746, have the name of J. F. Blondel attached to them.

BLONDEL (JACQUES FRANÇOIS), born 8 January 1705, is clearly mentioned in the registers of the Academy of Architecture as the son of JEAN FRANÇOIS, the subject of the preceding article, but he is frequently called Jean François, or simply François, by writers upon the history of books and buildings. It is difficult to comprehend that his reputation should have been overshadowed by that of his namesakes to such an extent that the scanty materials for a bibliographical notice must be sought in his own publications; for his works form the subject of a long list; and he was one of the first modern architects, certainly in France the very first, to open one, and the best, of those schools, or private academies of architecture, which have tended much to the advancement of the art in that country. Having obtained 6 May 1743 the approbation of the Academy of Architecture, Blondel, with several assistants, undertook the tuition of all branches of the science and art of building. When four courses of lectures were completed he paused, and resumed the series in 1749, granting twelve seats gratuitously as prizes; in 1750 he received six élèves from the ponts et chaussées with an annual fee from government of 400 livres each; and in 1753 a present in addition of 2,400 livres from the king. The appreciation of the capacity and merit of the director of this new studio, caused him to be nominated architecte du Roi, in November 1755, and a member of the Academy of Architecture when its numbers were enlarged in 1756; he was appointed in 1763 by the Academy to be professor at the Louvre, which position he held until his death 9 January 1774, at the age of 69, according to the register of the Academy.

Like his father, he was engaged in early life as an architectural engraver: the *Architecture Française*, commenced by Marot, was continued by Blondel, who drew and engraved the largest portion for Mariette the publisher, until eight volumes were completed. He was next occupied upon the treatise *De la Distribution des Maisons de Plaisance et de la Décoration des Edifices en général*, 2 vols. 4to., Paris, 1737, with 160 plates engraved by himself (a false title to this work is *Traité de l'Architecture dans le Goût Moderne*, which has led many writers to attribute to him a work by Briseaux called *Architecture Moderne*); the work was sold, to his great vexation, as the continuation of one by Tiercelet entitled *Architecture Moderne*.

In the edition of D'AVILER's *Cours* published in 1738, all that had been given by the original writer and by his editor Le Blond, on chimney-pieces, piers, windows, doors, panelling, cornices, and ceilings, was suppressed, and its place was supplied by illustrations chosen by Blondel; the new plates in the edition of 1760 are indicated by a star; and a comparison of the different editions will exhibit the extraordinary change of style which occurred in the first half of the eighteenth century: *Cours*, iv, 188.

Blondel was engaged by Jombert to write the descriptive text for a new work, which was also entitled *Architecture Française, ou Recueil des Plans, etc., des Églises, Maisons Royales, et Edifices les plus considérables de Paris*; the previous publication being thereafter called the *Recueil de l'Architecture Française*; the two first volumes appeared in folio in 1752, and two more in 1756, when the undertaking ceased. *Cours*, iii, 52, 99, 437.

He also printed the opening lecture of his second series 16 June 1747, entitled *Sur la manière d'étudier l'Architecture*; another entitled *Sur la nécessité de l'étude de l'Architecture* in 1754; and a third entitled *Sur l'utilité de joindre à l'étude de l'Architecture celle des Sciences et des Arts*, in 1771. This was extracted from his great work the *Cours d'Architecture civile*, in nine volumes, 8vo., Paris, 1771-77, the fifth, sixth, and ninth volumes of which were contributed after Blon-

del's death by P. Patte, who observes in page v of the preface to the fourth volume, that Blondel had always contended against the *formes captieuses* which were introduced in his time, and that in order to be able to criticise freely, he had pretended to publish the *Cours* in the name of a friend, rather than submit it for approbation, according to the statutes, of the Academy. A posthumous work called *L'Homme du Monde éclairé par les Arts* was published in two volumes, 8vo., Amsterdam, 1774. According to the statements in the *Cours*, iii, 143, iv, 121, 360, Blondel contributed the articles and plates relating to architecture which were employed by DIDEROT and D'ALEMBERT, in the *Encyclopédie*, fol., Paris, 1772. The work, in twenty-five plates, of *Profils of Ornaments and Vases*, generally called Blondel's, was engraved by his wife, Marie Michele Sticotti.

A design by Blondel for the Imperial Academy at Moscow made for the empress Elizabeth, 1741-1762, is mentioned in the *Cours*, iii, 259; his executed works comprise alterations to the château de la Grange (ii, 383), of which a remarkable plan is given: the improvements of the city of Metz, on his plan dated 1763 (iv, 395), consisting of the *plateforme de S. Etienne* and its fountain (ii, 41, 404; also given in BELIDOR, *Architecture Hydraulique*, 4to., Paris, 1737-53); the round church of the royal abbey of S. Louis (ii, 92, 93, 322); the episcopal palace (ii, 330); the façade of the building occupied by the *parlement* (i, 114); the *hôtel de ville*, executed by Le Brun from his design (iv, 403); a *corps de garde*; and other works accessory to his new arrangement and alignment of a portion of the city; with the Doric portico to the principal doorway of the cathedral, for which, however, he recommended a design in conformity with the Pointed style (ii, 311, 347); the improvements of the city of Cambrai, on his plan approved in 1766 (i, 117); (it is not clear whether his illustration of the château Cambresis is meant to exhibit more than his mode of laying out the grounds; MILIZIA states that he built it): the improvement of the town of Strasbourg, on his plan approved in 1768 (ii, 467), consisting of a *place d'armes*, barracks for cavalry and infantry, and other buildings, besides designs for a theatre, senate house, markets, quays, bridges, etc. (iv, 419): to which MILIZIA adds a gateway to the archiepiscopal palace in Cambrai, and several country-houses in various parts of France and Germany, especially in Flanders.

BLONDEL (JEAN BAPTISTE), the last of this family, was also one of the architects to the city of Paris. Conjointly with de Lannoy he directed the reconstruction of the building called the Temple in that city as it now exists; it was erected in 1781 from the designs of Pérard de Montreuil; LEGRAND and LANDON, *Description*, 8vo., Paris, 1809. He also constructed the well-known building, illustrated in the work entitled *Plan, etc., et Détails du nouveau marché S. Germain*, fol. Paris, 1816, with eleven plates. According to QUÉRARD he died in 1824.

BLOOM. The name given by iron manufacturers to the balls of refined iron prepared in the puddling furnace for the purpose of being beaten out under the shingling hammers, previously to their being rolled into bar-iron. The charge of a puddling furnace is usually of about four cwt. which is made up into five or six blooms.

G. R. B.

Bloom is also explained by NEVE, *Dict.*, as a "four-square piece of iron of two feet long."

BLOUET (GUILLAUME ABEL), born at Passy, near Paris, in 1795, was a pupil of Delespine, and became a member of the French Institute, professor in the Academy of Fine Arts at Paris, and honorary and corresponding member of the Royal Institute of British Architects. In 1821 he obtained the second *grand prix*, and in 1826 the first premium; between those years he gained six medals, and the prize called départementale. In 1826 he was sent to Rome, and there made his studies for the publication of his *Restauration des Thermes d'Antonin Caracalla à Rome*, fol., Paris, 1828. He was also entrusted with the direction of the artistic portion of the preparations for the pub-

lication entitled *Expédition Scientifique de Morée*, fol., Paris, 1836, for which he was enrolled in the legion of honour. Being sent also by the government to America, for the purpose of studying the cellular system of prisons, he published *Instruction et Programme pour la Construction des Maisons d'Arrêt et de Justice*, with plans, fol., Paris, 1841; and *Projet de Prison Cellulaire pour 585 Condamnés*, fol., Paris, 1843. He published a supplement to RONDELET, *Traité Théorique, etc., de l'Art de Bâtir*, fol., Paris, 1847-48, and revised the tenth edition of that work. He was entrusted with the completion of the *arc de l'Etoile*, which he did not quite finish; and with several difficult restorations to the palace at Fontainebleau in his capacity of architect to that building. He had also just been commissioned to erect its parish church, to cost 200,000 francs, when he died in 1853, and was buried in the cemetery of Mont Parnasse. *BUILDER JOURNAL*, xi, 357. Two houses at Passy (1828 and 1839) given by NORMAND, *Paris Moderne*, 4to., Paris, 1837, i, 26 and 46, with the initials G. A. Bet., may be ascribed to this architect.

BLOWING MACHINE. A machine for giving BLAST in volume or quantity; it is used in smelting, heating, and ventilating; for the latter purpose it is likewise frequently adopted for exhausting the foul air of a chamber. These machines take the form of fans, screws, or valves, as described in the *Detached Essays*, HEAT, p. 10, VENTILATION, p. 5.

BLUE (It. *turchino*; Sp. *azul*; Fr. *bleu*; Ger. *blau*). The ancient materials for a blue colour seem to have been both natural and artificial. *Armenium*, named from the country whence it was procured, and known to have been a greenish blue, was probably made from the stone still called *lapis armenius*, AZURE; *cœruleum* was a sand procured from Egypt, Cyprus, and Scythia; from the two last-named countries the material was a natural production; and the Scythian was ground and washed, when it was called *lomentum*, and gave four different tints, which were imitated in Spain and at Puteoli; the Egyptian, also factitious, was the best of all, and when washed at Puteoli the lighter coloured portion was called *restorium*. *Tritum* was the refuse of the *lomentum*. Besides these there was the *purpurissimum indicum*, probably indigo and its imitations. The indicum and cœruleum being used in wax and not in water, were not adapted to works in fresco. PLINY, *Hist. Nat.*, xxxiii, 57; xxxv, 23 to 31; VITRUVIUS, vii, 8 to 13; THEOPHRASTUS, *De Lapid.*, 98.

DAVY, *Phil. Trans.*, 1815, came to the conclusion that all these varieties of the cœruleum were frits of copper, or what he there calls smalt, and that although cobalt was probably known under the name of χαλκός to the Greeks and Romans, and was certainly used in their glass, it was not employed as a pigment by them. MINUTOLI, *Reise zum Tempel*, 4to., Berlin, 1824, pp. 333 and 351, states that the ancient Egyptian blue was a copper frit, and the recent imitation is probably the same.

The modern blues are also natural and artificial. Of the first sort are ULTRAMARINE; COBALT BLUE, also called AZURE, *Paris blue*, or *Vienna blue*, and very improperly *ultramarine*; BLUE OCHRE, BLUE VERDITER, MOUNTAIN BLUE, BLUE CARMINE, and one sort of SANDER'S BLUE. The only natural vegetable blues are INDIGO and its perfection INTENSE BLUE. The chemical blues are PRUSSIAN BLUE, also called *Berlin blue* and *Paris blue*; ANTWERP BLUE, also called *Haerlem blue*; SCHWEINFURT BLUE; and a second sort of SANDER'S BLUE; SMALT, also called *azure*, *Dumont's blue*, *powder blue*, *artificial ultramarine*, and ROYAL BLUE; and several varieties of the above, such as DUTCH ULTRAMARINE, LAMBERT'S BLUE; THÉNARD'S BLUE; TURNBULL'S BLUE, etc.

BLUE BLACK. A pigment not so much used in water as in oil; it is a vegetable charcoal procured from the north of Europe, where it is made from the resinous portions of the fir. It is the black most generally used in house painting, on account of its cheapness. Being of so fine a body it requires no grinding with oil, but as it takes a long time to dry, it requires to be

mixed with a drier; it is sometimes calcined, and must then be ground. 4.

BLUE CARMINE. An oxide of molybdenum, of a beautiful blue colour, which is said to be durable when exposed to the light, but disposed to change when mixed with other pigments, and easily blackened by sulphuretted hydrogen. 9.

BLUE GUM WOOD, see EUCALYPTUS.

BLUE LIAS. The common name of the lowest member of the oolitic formation, which occurs in England in a narrow irregular band, stretching across the country from Whitby in Yorkshire to Lyme Regis in Dorsetshire, and in isolated patches in South Wales and Somersetshire. It occurs also in France, immediately in the neighbourhood of the great oolitic beds, and in numerous other parts of the continent and in America.

This formation does not produce any building stone of great value, although it is quarried for local purposes which admit of the use of, or require, long, narrow, and rather thin stones, as for window sills and steps. Small rubble stones are also obtained from the lias formation, but in no case does it yield what is generally termed ashlar. Occasionally the beds of stone are intercalated between layers of stiff blue clay; and it almost always happens that the beds of stone immediately in contact with this clay assume the character of a strongly marked argillaceous limestone, which yields one of the most valuable hydraulic limes.

It is extremely difficult, and perhaps almost impossible, to give any quantitative analysis which could fairly be considered to represent the normal composition of the blue lias. Every layer in a quarry will be found to differ more or less decidedly from those above or below it; and the differences in the mineral nature of the various members of this formation are even more distinctly marked when large areas are considered. The beds which are extracted for the purpose of burning for lime, however, may be said to consist principally of the carbonate of lime in combination with the silicate of alumina, some oxide of iron, potash, and a small quantity of sand in mechanical mixture; but the ingredients insoluble in nitrous acid, such as the silicate of alumina and the sand, vary in every imaginable proportion between 5 and 18, or at times 20 per cent. It is on this account that blue lias lime differs so remarkably in its qualities; and it becomes, therefore, the more necessary to exercise caution in the selection of the stone to be employed in the furnace. The best blue lias lime is obtained from the beds of calcareous marl which contain about 16 per cent. of the silicate of alumina.

Smeaton was the first engineer who called attention to the value of this lime, and he applied it, in conjunction with Roman pozzolana, in the Eddystone lighthouse. Since his day blue lias lime has maintained a deservedly high reputation among architects and engineers for water works; but the carelessness of the burners has tended much to limit its use. The principal objection to the blue lias lime used in London is founded upon the large proportion of underburnt or unburnt stone left in it, which would be easily obviated by a little attention to the management of the kilns. The best blue lias lime brought into the market is obtained from Aberthaw in South Wales, Watchet in Somersetshire, or Barrow in Warwickshire; but it would appear that, although not so highly prized, the limes from Whitby and from Lyme Regis are nearly equal to them.

Another serious objection, or rather practical difficulty, especially in the neighbourhood of London, attending the use of blue lias lime, arises from the ignorance and carelessness of the workmen using it. Accustomed as they are to the use of very inferior and moderately hydraulic limes, they will not take the requisite pains for slaking this lime, and manufacturers have therefore endeavoured to obviate the difficulty by grinding it. But in important works the use of ground lime should not be tolerated, because the grinding necessarily mingles core with the properly burnt material; and it is preferable to encounter the loss from the core, rather than thus to diminish the effi-

ciency of the lime. The best practical mode of slaking blue lias lime is to break the lumps into pieces of about the size of a nutmeg; then to immerse them upon a sieve in water, and keep them therein until air-bubbles freely rise to the surface: and to leave the lime so wetted in a heap, covered by damp sand, for the space of twenty-four hours. At the expiration of that time it should be screened and mixed with the proper proportions of sand, with the least possible quantity of water. Blue lias lime rarely carries more than from twice to twice and a quarter its bulk of sand, to one of lime; and, when slaked, it does not sensibly increase in bulk, unlike the ordinary chalk or stone lime of the neighbourhood of London. G. R. B.

BREES, *Glossary* s. v., attributes to submarine blue lias more efficacy in stopping leakage in water works than ordinary lias, arising from its saline properties.

BLUE OCHRE, called improperly also *native Prussian blue*. A native earthy subphosphate of iron found in Cornwall, and also in North America: it is of great value as a pigment in oil and water, being a modest deep blue colour, which dries readily, is not disposed to change when mixed with other pigments, or when exposed either to the light or to sulphuretted hydrogen. 9.

BLUE VERDITER, otherwise called BLUE BICE. A carbonate of copper, used as a water pigment, of a light blue colour, and very gritty. Acids readily act upon it, and sulphuretted hydrogen blackens it. When boiled it makes a green called green bice or green verditer. 9. 14.

BLUE VITRIOL, sometimes called BLUE STONE. Sulphate of copper.

BOARD (It. *asse*; Sp. *tabla*; Fr. *planche*; Ger. *bret*). Timber cut up into thin slabs forms what are commonly called boards. The word board is almost universally applied to fir and elm, while the same thickness of oak, mahogany, etc., is generally called a plank. The term board is familiarly applied to a piece of stuff 9 inches wide, and not more than $2\frac{1}{2}$ inches thick; but technically speaking a board is a piece of stuff not exceeding $1\frac{1}{2}$ inches in thickness, sold by the board, and not by the foot superficial like planks.

Boards cut from 7 in. stuff are called	batten boards,
" 9 "	deal boards,
" 11 "	plank boards.

With regard to width

Stuff from $6\frac{1}{2}$ to 7 ins. wide is called a	batten,
" 8 to 9 "	deal,
" 10 to 20 "	plank,

quite irrespective of thickness (they are, however, generally from $2\frac{1}{2}$ to 3 inches thick).

With regard to thickness

$1\frac{1}{2}$ stuff is called a	board	} irrespective of width.
" " "	plank	

STUFF 4 by 3, 5 by 4, 6 by 4, 7 by 4, 8 by 4, 9 by 5, etc., and intermediate sizes, is cut from timber, and is called SCANTLING. Stuff over 6 inches thick, and from 10 to 16 inches wide, is called thick stuff, and sold at per foot cube. G. A.

The term board is used in conjunction with other words to express a particular condition or purpose to which it may be applied, as BARGE-BEARD, COVER-BEARD, EAVES-BEARD, FEATHER-EDGED-BEARD, FLOOR-BEARD, GUTTER-BEARD, LEAR-BEARD, LINING-BEARD, LISTED-BEARD, LOUVRE-BEARD, STAIL-BEARD, SCAFFOLD-BEARD. 1.

One of the rooms at Engelsholm in Denmark, built by BRAHE, is floored with boards each 48 feet in length.

BOARD AND BRACE WORK. Boards with grooved edges, into which grooves thinner boards are inserted, and this alternation of thicknesses is one of the methods of forming common partitions.

BOARDED FLOOR. A floor made of boards as described under that head, in opposition to a BATTEN FLOOR.

BOARDING. A general term for various kinds of work in which boards are employed: as for deadening sound, SOUND-BOARDING, and for furring, also called *sound-boarding*. Board-

ing for a FLAT or GUTTER is the rough floor which immediately receives the metal covering; it is rarely less than one and a quarter inch in thickness, and is sometimes laid with rough joints, which damage the lead work if it be much trodden on. Boarding for SLATING is also rough boarding placed either *diagonally* or *parallel* to the rafters, or on the purlins if there be no rafters, in which case it is called SLAB-BOARDING; and is too frequently not more than three-quarters of an inch in thickness. Boards joined or laid together have the edges *shot*, i. e. planed; or else shot and ploughed and tongued, or shot and doweled: when the sides are planed also, they are called *wrought*: flooring boards are therefore described as wrought on one side and edges shot. If the thickness of the boards does not allow of doweled or tonguing, the edges, whether shot or rebated, are only joined with glue; white lead mixed with linseed oil being used in external work. A board which is thinner on one of its horizontal edges than on the other is said to be *feather-edged*. The edges of the boards used for the above purposes are rarely *shot*, and still more rarely ploughed and tongued or rebated; but they are *sprung* or chamfered in very superior work. MATCH BOARDING; PLOUGHED AND TONGUED BOARDING; RUSTICATED BOARDING; VALLEY BOARDING; WAINSCOTING; and WEATHER BOARDING. 1.

BOARDING JOISTS. The term sometimes used, but now nearly obsolete, for the joists which carry the boards of a floor. A. A.

BOARD ROOM. The chamber in which a committee of management holds its sittings. As there is frequently a crowd of persons to hear the proceedings or to transact business with the committee, a waiting room of proportionate size is required, as well as a vestibule, cloak room, dressing closets, secretary's or clerk's offices, and similar accommodations. When a board has to transact business with strangers, it is generally considered desirable that the members should be seated along one of the walls of the room with their backs to the light; in most cases the best arrangement is a central table and a lantern light.

BOAST. Besides expressing the employment of the *boaster* below described, this term is used by masons, carvers, and modellers, for the operation of getting out the general form and mass of any ornamental work.

BOASTER. A chisel two inches wide in the cutting part, being one of the tools used by masons in preparing stone. A boasted ashlar is an ashlar stone wrought on the face with this chisel so as to leave regular marks like ribbands or small chequers: it is used to produce better work than that given by the employment of the broad axe; the stone in either case being previously scapled or else broched. If the marks are irregular and rough, it is called a *random-tooled* or *dressed* ashlar. Sometimes a margin draft only is so worked.

BOAT HOUSE. A building intended for the protection of a pleasure boat against heat, rain, and the inclemencies of the winter season. For this purpose natural and artificial covers have been employed; but unless very large, they are as deficient in convenience as the commonest hut, into which the boat is drawn like a carriage. A boat house should be large enough to contain a party while waiting in rainy weather; a bedroom and dressing closet, etc., in case of accidents; and a copper or other means of obtaining hot water: a bath is a very desirable adjunct. The canal for the boat should be only deep enough for it when fairly loaded, and this canal should run so far under a bridge that the seats of the boat can be brought under the edge of the bridge, and that persons can step quietly into their places in the boat. Floating platforms are too dangerous to health and safety to be tolerated in a good boat house. The doors are best made as coach house gates to open outwards, with ropes attached to rings on the inside for fastenings. The roof or upper floor should be strong, and provided with ropes and pulleys, so that boats may be hung up when not likely to be wanted for any length of time.

BOAT NAILS, see CLENSH NAILS.

BOB or **PLUMB-BOB**. The weight attached to the line of a **PLUMB-RULE**, and swinging in the hole cut to receive it in the rule. A bob has been for some time made of brass turned true, very heavy, and having a steel point at the end, so that when dropped it marks correctly the end of the plumb line. A. A.

BOBANESWAR in India, see **BHOBANESWAR**.

BOBBIO. A city in the province of the same name in the Sardinian states. It was made the seat of a bishopric in 1014. The cathedral, dedicated to the Assumption of the Virgin and to S. Peter; a *seminario*; an hospital; the remains of a convent and three monasteries, especially the church (now parochial) belonging to the large and handsome monastery of S. Columbano; the episcopal palace; and the palazzo Malaspina, are the chief buildings of importance. 96.

BOBIEE. The native name of a light coloured wood of Canara, East Indies, used for building purposes. 71.

BOCCADORO (**DOMENICO**), called by the French **DOMINIQUE DE CORTONE**. The rebuilding of the *hôtel de ville*, erected in the *place de Grève*, on the site of the *maison aux piliers* at Paris, commenced in 1533 in a Pointed style, was continued slowly and with many modifications until 1549, when Boccadoro presented to Henry II at S. Germain-en-Laye a design in conformity with the Italian art of the period; the building was remodelled and finished in 1605 from his drawings, but was restored and altered in 1801 by Molinos, and enlarged between the years 1836-1854. **BLONDEL**, *Architecture Française*, fol., Paris, 1752, ii, 114; **LEGRAND** and **LONDON**, *Description*, 8vo., Paris, 1809, ii, 82.

BOCCALINO (**GIOVANNI**) completed in 1563 the palace of the Canonicate at Loreto, designed by Bramante. 73.

BOCCANEGR (**MARINO** or **MARTINO**), **BOCANERA**, **BOCANERA**, or **BOCANEGRA**, commenced at Genoa in 1215 according to **SOPRANI**, but clearly 1275, the construction of the arsenal, which was discontinued; in 1276-78 he executed the *mandracchio* or harbour for small vessels; he reinstated the foundations of the towers of the city gates, and repaired many of the public and private buildings that were damaged by the inundation which happened in the last named year; in 1283 he finished the arsenal, and commenced the old mole (**FOLLETA**, *Historia*, fol., Genoa, 1585). He next undertook the construction of the aqueduct from Tressasco, finished in 1295; assisted in the construction of the *palazzo reale*, of which the foundations were laid in 1295; and in 1300-1301 deepened parts of the harbour: **GIUSTINIANI**, *Annali*, fol., Genoa, 1537. During the execution of these works he had been constantly engaged upon the mole; and probably directed its construction until his death, which occurred after the year 1306. 68.

BODT or **BOTT** (**JOHANN VON** or **JEAN DE**) was born at Paris in 1670. Being compelled in 1685 or 1686, as a Protestant, to quit France, he went to Holland, and accompanied the expedition of the prince of Orange to England in 1688, as a military engineer. According to *Berlin and its Treasures*, 8vo., London, 1855, he took an active part in the erection of the new buildings, after the fire in 1691, at Whitehall in London. In 1700 he was named by the elector of Brandenburg, as successor to Grunberg, chief architect at Berlin, where he continued the building of the arsenal, with many alterations made by Grunberg and himself from Nehring's design; and in 1701 he completed the *schloss*, and built the *schloss-thor*, with the *kuppel* in the market place at Potsdam: the façade of the *steechbahn* was also designed and built by him. He subsequently erected several large mansions; the *Johanniter* palace at Berlin was built by Richter from his design. After 1713 he was made commandant at Wesel, where he executed the fortifications, and built the handsome *Berliner-thor*. He entered the Saxon service in 1728, became field master-general of artillery in 1741, and died in 1745 at Dresden, where, as at Königstein, many buildings were constructed from his designs. 68.

BODY. This term is applied to pigments to express their capability of being ground so fine and of mixing with oil so

entirely as to seem only a very thick oil, working well, spreading smoothly and covering entirely the material upon which it is laid. Smalts, verditer, red lead, and bice, are considered to have an indifferent body, as although they will cover the groundwork, they will hardly grind to an oily consistency, and will not lie entirely smooth. Many other pigments readily part from the oil when they are laid upon the work, unless mixed up to form a very thick paint, and are therefore said not to bear a body. 4.

From some recent experiments with zinc whites, and the difference between them and white lead, it has been supposed that some chemical combination takes place when pigments are mixed with each other, which affects the body of the paint and its power of bearing out. A. A.

BODY or **CORS** (Fr. *corps*). A pillar or pier of nearly equal, if not equal, diameter at top and bottom, placed with its sides parallel or diagonally against a wall, and used in various periods of Pointed architecture. The moldings that separate its different stages run round it, and the diminution or change of diameter, besides being much less than in a buttress, takes place equally in both diameters. It might either surmount a buttress or rise from the ground, but it never has the appearance of sustaining a lateral pressure. **WILLIS**, *Architectural Nomenclature*, 4to., Cambridge, 1844.

BODY BOTERASSE. A buttress so called because applied against a **CORS** or body; **WILLIS**, *Architectural Nomenclature*, 4to., Cambridge, 1844.

BODY COLOURS. The usual water colour pigments rendered opaque by being mixed with body white, which is now a zinc white, but was formerly a levigated flake white, viz. an oxidized carbonate of lead. 9.

BODY OF A NICHE. The entire upright wall of a niche. This term is generally applied to niches with walls upon polygonal or curved plans, and not to square niches.

BODY OF A ROOM. The main portion of an apartment, independent of any recesses.

BODYRANGE OF A GROIN. The wider of two vaults, where one vault intersects a larger one.

BOEBLINGER (**HANS**) commenced the *Frauenkirche* at Esslingen, near Stuttgart in Wurtemberg, which after his death in 1482 was continued by Mattheus Boeblinger. **WEBB**, *Sketches*, 8vo., London, 1818, p. 159, states that at the foot of a small wooden image of the Virgin, on the left column by the front principal entrance to the nave of that church, is the following inscription—"Hie ligt begraben Hans Boeblinger maister dis Hüs des gedencken (or gedenkent) durch Gott"; describes an accompanying mark ff ; and adds that "the sacristan gave it the date of 1492. The son of this man is also buried there, at the west end of the south aisle, with the same mark, and the date 1509. The same mark is repeated all over the church", etc., and continues with a description of their edifice. **HOFFSTADT**, *Gotische A. B. C. buch*, fol., Frankfort, 1840, pl. 26, p. 528, gives fac similes of some drawings signed *Ich Hanns von Böblingen ain Stainmetz*, 1455, in which the same mark ff is repeated. 92.

BOEBLINGER (**MATTHAEUS**) finished the *Frauenkirche* commenced by his father, and is buried therein, as is presumed from a stone adjoining the winding stairs leading up to the tower, which bears the name Boeblinger, and the date 1505, with a square. He is also said to have built the *Katharinenkirche* in that town, which was much dilapidated in 1815; the curious portal is given in part vi, pl. 7, of **HEIDELOFF**, *Archit. Ornaments of the Middle Ages*, fol., Nuremberg, 1840; and the hospital church (*Spitalkirche*), no longer existing, which he commenced in 1482, at the same time that he was engaged at Ulm. While this church is said to have evinced not only the poverty of the times, it is owned that the hand of a master was displayed in the construction of the vaults and piers. He was also employed at Frankfort-on-the-Maine, as mention is made of his "opinion" in the building expenses for the year 1483 of

the parish church tower. The dates given by various authors of his employment at Ulm are doubtful, as 1465 and 1474 appear too early, while 1492 is clearly the date of his flight from that city to escape from popular animosity occasioned by the fall of some stones from the vaulting of the cathedral tower, which latter was 237 feet high: the tower settled, and the arches have been filled up. Being the sworn servant of the city, he could not obtain employment elsewhere, and it was not without reiterated applications from himself and count Eberhard the elder of Wurtemberg, for whom he had previously worked, that he was released from his obligations to the city; he bound himself, however, never to be found in the city and township, and to prefer no claim against it on account of his services at the *Pfarrkirche*. At Ulm he also designed the "Mount of Olives", on which he himself worked, as appears from a note on the plan of it as it appeared in 1517; this drawing on parchment was extant in the Furstenbach collection: it is also shown in the engraving of the cathedral by Jacob Geiger and Johann Frank in 1659. 68. 92.

BOEBLINGER (DIONYSIUS), probably of the same family, was engaged upon the continuation of the works at Ulm from the year 1503. 92.

The BOEBLINGERS seem to have worked also at Stuttgart: where the seats of the *Spitalkirche* deserve notice for the carved work, and one of them in the choir is inscribed "1420 (1490 in NAGLER) hat hanns ernst von Beblingen dess werk gemacht." It is not easy to determine whether the word Boeblinger refers only to the place of this artist's birth, a village near Stuttgart; or whether it was the family name of the architects at Esslingen; or whether all belonged to one family; these questions have been discussed by WEYERMANN in the *Kunstblatte* for 1831, and by JAEGER in the same periodical for 1829 and 1834. WEBB, *Sketches*, 8vo., Lond., 1848, p. 157. 68.

BOEHEIM (HANS) "of the Peinth" or *Bauhof* (building establishment) at Nuremberg, died there in 1531, according to the inscription affixed to his portrait; but 27 August 1538, according to several manuscripts. He enjoyed so great a reputation that he was consulted in 1516 and 1518 upon the erection of a bridge at Bamberg. Most of the public edifices executed between the years 1490 and 1530 at Nuremberg are attributed to him. One of his sons, HANS BOEHEIM, built in that city the *Kanzleizwinger*, and, according to the date on his portrait, died in 1563. PAULUS BOEHEIM, another son, was buried in the churchyard of S. Rochus at Nuremberg, that church being his masterpiece. He died in 1561, aged 42: there is also a portrait of this artist. 68.

BOEHME (MARTIN HEINRICH) of Berlin, was a pupil of Schlüter and Eosander, then their clerk of the works, and subsequently surveyor to the *schloss* or palace in that city. The government lost Eosander in 1713, and Boehme completed in 1715 the works, and was made court architect. He built many mansions in Berlin, the *schloss* in Friedrichsfeld, etc.; and died in 1725. His son MARTIN FREDERICK BOEHME was inspector of buildings and army councillor in the Altmark and Priegnitz, and was living at Stendal in 1790. 68.

BOEHRER (BLASIUS) finished in 1498 the church of the Holy Cross at Goerlitz. 92.

BOENECKE (HANS) finished in 1504 the tower of the *Jacobikirche* at Stettin. 92.

BOFFY (GUILLERMO) was in 1415 *maestro-mayor* of the cathedral at Gerona in Spain, when his works were so severely criticised that the chapter held, 24 January 1416, a meeting of the leading architects in Spain, who gave their opinions on oath in favour of the plan of building a nave without aisles, according to the original idea of Boffy, who thereon was desired 15 March 1417 to proceed as seemed best to himself. The evidence has been printed, and is extremely interesting. 66.

BOFFRAND (GERMAIN or GERMAIN DE), the name is also written by BLONDEL Boisfranc in the *Cours*, 8vo., Paris, 1771, iii, 488, and Boisfrand in the *L'Homme du Monde*, 8vo.,

Amst., 1774, ii, 313, was the son of the sculptor Germain, and was born at Nantes (not Nancy) in Bretagne 7 May 1667; *Cours*, i, 104. He gave the materials for a memoir to DEZALLIER D'ARGENVILLE, from whose work, *Vies*, etc., i, 419, it appears that Boffrand arrived at Paris in 1681, and studied under his uncle the celebrated poet Quinault, as well as at the academy and under Girardon. J. H. Mansart received him as a pupil at Versailles, where the *orangerie* was being erected (1685), and 1699 (1689, surely) entrusted him with the charge of the construction of the first *place de Vendôme*, which was executed under his care up to the first floor before it was demolished for the existing smaller *place*. Mansart also obtained for him the charge of the *bureau des dessins du Roi*, which he resigned when Mansart succeeded Villacerf in 1699. In 1709 he was elected into the Academy of Architecture; and in 1710 the princess de Condé commissioned him to repair the palais du petit Bourbon, an undertaking which amounted to a reconstruction. BLONDEL, *Arch. Française*, fol., Paris, 1752, i, 238, illustrates the hôtel de Rével, built in 1704, and afterwards belonging to the Sieur Poulain de Beaumont, for whom Boffrand altered and decorated it in the year 1711; it was then sold to the maréchal comte de Broglie. Boffrand built for himself in 1714 a large house in the rue de Bourbon, given in the *Arch. Fran.*, i, 280, which was sold to the marquis de Torcy; and near to this he built in 1716 another mansion, not quite so large, which was purchased by the marquis de Seignelay; it is also given in the *Arch. Fran.*, i, 282. About the year 1718 he built another house for himself, which is also given in the same work, iii, 153; it was sold in 1722 to the duc de Duras. At the same time he was engaged in designing and erecting the two façades, that still (1851) remain, of the arsenal which existed at Paris until early in the reign of Louis XIV, and was not formally suppressed until 1788. BLONDEL, *Cours d'Architecture Civile*, 8vo., Paris, 1771, ii, 446, fixes 1722 as the date of Boffrand's restoration of the *grand chambre* of the Parliament in the *palais de Justice* at Paris, and 1725 as the epoch of the restoration by the builder Pinel, under Blondel's direction, of the southern rose window and the vaulting of the transept, and the decoration of the *chapelle de Nonilles* of the cathedral church of Notre Dame, at a cost of 200,000 livres; *Arch. Fran.*, ii, 107. In 1728 he succeeded to de l'Epine as architect to the *hôpital général*, to which establishment he always gave his services without fee or reward. From this time, or perhaps from a rather earlier period, he was much engaged on works in the French provinces, in Germany, and in Lorraine, the principal of which were Bouchefort, now called Boisfort, near the village of the same name in the forest of Soignies near Brussels, which was a hunting residence for Maximilian Emanuel, elector of Bavaria, then governor of the Pays Bas; but discontinued after the works had been raised as high as the first floor; *Commission Royale d'Histoire de Bruxelles, Compte rendu*, xiv, 531; *Messenger des Sciences*, etc., 8vo., Ghent, 1825, p. 425: the hôtel de Craon, afterwards the palace of Stanislas I, at Nancy, in the *place de la Carrière*; and the château de Harroué, on the river Madon in Lorraine, for the prince de Craon; the château at Luneville for the grand duke Leopold of Lorraine (to which additions were made by the grand duke Stanislas, who used it as a palace, but it afterwards became the *caserne de gendarmerie*), for whom he designed a palace, of which the façade only was built, in the *place de la Carrière* at Nancy; and for whom also he, as chief architect, built a château called the palais de la Malgrange, about a mile from Nancy. This is perhaps the best of his designs; the first design by Boffrand was not approved, but was published by him: both buildings were destroyed before 1788. Besides these commissions he was required to alter the plans originally made by Neuman, and to design the elevations of the proposed magnificent episcopal palace at Würzburg in Franconia, which was stopped at the death of the prelate who had projected it.

These foreign works are contained in his publication entitled

Livre d'Architecture contenant les Principes généraux de cet Art, et les Plans, etc., des Bâtimens faits en France, etc., fol., Paris, 1743, which also illustrates the hôtel Amelot, afterwards de Montmorency, afterwards Tingry, afterwards Querchy, in the rue S. Dominique, also engraved in *Arch. Fran.*, i, 242; the hôtel d'Argenson in the rue des Bons Enfans, *Arch. Fran.*, iii, 52; the exterior (1706) and interior (1740) decoration of the hôtel de Soubise, *Arch. Fran.*, ii, 157-59, which last was immediately followed as a model, BLONDEL, *Discours*, 12mo., Paris, 1754, p. 66; the *porte* of the palais du petit Luxembourg; the *porte* of the hôtel de Villars; the upper order of the portal of the *église des pères de la Merci* (the oval columns in the lower story were erected by Cottart, *Cours*, iii, errata); all these were at Paris, and the *Livre* further contains the *puits de Bicêtre*; the château de Cramayel, situated twenty-one miles from Paris, for the marquise d'Ambré; a stone bridge of three arches at Sens; and a timber one of fourteen bays at Montreau Faut Yone. In 1748 he designed and built the chapel and main buildings of the *hôpital des Enfants trouvés*, in the rue neuve Notre Dame at Paris, which has been engraved by Patte, it is given in the *Arch. Fran.*, ii, 101; as well as the neighbouring Doric portal to the cloisters of the cathedral, engraved in the same work, ii, 113. This last erection is remarkable for having been "designed before the author's journey to Berlin" (VIRROYS); it was in hand in 1752 (*Arch. Fran.*, ii, 113); and received from himself as a correction the addition of a bas-relief in each of the blank windows over the small doorways. He died 18 March 1754, not 1755, being then dean of the Academy, first architect to the king, *pensionnaire des bâtimens du Roi*, and first engineer of the Ponts et Chaussées, in which office he succeeded Gabriel in 1742.

Undated works ascribed to Boffrand in the *Cours*, vi, 470, include the maison du prince de Rohan at S. Ouen, *Arch. Fr.*, i, 242; the bridge at Corbiel; and new buildings for the hospital at the château de Bicêtre, at the Salpêtrière, and at Cipion: to which DEZALLIER adds at Paris the hôtel de Guerry in the rue S. Dominique; the hôtel de Voyer near the Palais Royal; the hôtel de Tingry in the rue de Varennes, of which details are given in the *Cours*, ii, 178, pl. 82, fig. b; the maison le Brun in the rue S. Victor; the maison de Montaran in the rue des Francs Bourgeois; the restoration of the church of S. Esprit; and near Melun the château de Borrette, constructed in great part from his designs. In 1748 he made five great designs for improvements in Paris, of which those for the *place Dauphine*, a large market place, and a courtyard between the Tuileries and the Louvre, are engraved by PATTE, *Monumens*, fol., Paris, 1767, pp. 191, 194, 196. A design for a *salle d'opera* is also mentioned by DEZALLIER.

He also wrote a *Life of Quinault*, Paris, 1715; some light comedies printed by GHERARDI; and the celebrated *Description de ce qui a été pratiqué pour fondre d'un seul jet la statue équestre de Louis XIV en 1699*, fol., Paris, 1743, with nineteen plates, of which that representing the furnace is rarely found: the drawings were made by Boffrand on the spot; and fifty years afterwards, when a similar operation had to be performed by Lemoine, only Boffrand himself was possessed of traditional experience and knowledge of the means employed by Keller on that occasion. He was the first at Paris to use a pugmill for mixing mortar; and he called attics the (*honteuse*) disgraceful portion of architecture.

His eldest son, who died in 1732, and Patte, were his pupils; as well as his younger son, who had been much employed by M. Orry at his château de la Chapelle, but died in 1745.

PATTE, *Abregé de la vie de G. Boffrand*, is given in the same author's *Discours sur l'Architecture*, 4to., Paris, 1754.

BOGHAZKOL, in Asia Minor, the modern name of TAVIUM.

BOGHOS, i. e. PAUL, an Armenian as is evident from his name, is commemorated in an inscription of which the date is presumed to be anterior to 998, given by DUBOIS DE MONTPEREUX, *Voyage*, Paris, 1839, iii, 214, pl. 9, as the architect of

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the church of the monastery of Sion, near Aténi in Georgia, the plan of which is copied from that of Sta. Ripsime at (Vagarchabad or) Echmiadzin, an edifice of strictly ARMENIAN architecture.

BOGLEM (MAISTRE LOYS VAN) was the architect of the very interesting church of Notre Dame de Brou, erected in a style of Gothic merging into Renaissance work (1511-36) outside the walls of Bourg, in the province of Bresse in France. 28.

BOGLIPORE. The capital of the district of the same name in the province of Bahar in India. The town is more famous for its two ROUND TOWERS, called *padoka* ("feet"), which are supposed to be of JAIN origin, than for its Roman Catholic church, the Mahometan college and mosques, the European houses, or the miserable bazaars. The towers are situated about a mile to the north-west of the town, and are stated by FRANKLIN, *Inquiry*, 4to., London, 1815-1822, to be 17 feet wide and 80 feet high, which must be 130 feet, according to the illustration given in that work.

BOGNOLO (FRANCESCO) built in 1742 the church of S. Toma at Venice. 14.

BOGOTA, in South America, see FÉ DI BOGOTA (SANTA).

BOILER. The name given to any close metal vessel in which water is heated and steam generated. For the purpose of warming buildings it is sometimes made of copper, but on account of the expense of that material, the boiler is more usually made of cast iron when it is to be used for heating only, and of small size; and invariably of wrought iron when it is employed for the generation of steam. FAIRBAIRN, *Lectures on the Construction of Boilers*, 8vo., London, 1851. *Detached Essay*, HEAT, p. 11. COPPER.

BOILER PLATE (Fr. *tôle de fer*). A general term for a sheet of wrought or rolled iron: when speaking strictly it is usual to call such plates boat plates, bridge plates, boiler plates, etc., according to the purposes for which they are intended: they are termed *sheets* when under a quarter of an inch in thickness; *plates* from a quarter of an inch to two inches thick; and *slabs* when more than two inches thick: they are named Crown, Mitre, B. B., S. C., Low Moor, etc., according to the quality of the iron, or the locality where they are manufactured, and are made of all sizes, but those most in use are from 6 feet to 9 feet long, 2 feet to 4 feet wide, and from a quarter of an inch to three-quarters of an inch thick; when over or under certain sizes they increase in price: about two tons is as yet the greatest weight of a single plate. The weight of a square foot of wrought iron one inch thick being about forty pounds, the breaking weight per square inch of sectional area is generally taken for practical purposes at about twenty tons, a third of which is usually considered as the safe limit of weight. The following is the usual plan of manufacture: a plate about 18 inches square being laid down, a heap of scrap iron is placed upon it about 4 inches thick; this is then put in a ball furnace, where it is brought to a white heat, which partially runs it together; it is then put under the tilt hammer, or Nasmyth's steam hammer, until beaten into a solid homogeneous mass, which mass is called a bloom; it is again put into the furnace, after which it is passed through several pairs of rolls until it is brought to the length, width, or thickness required—the thickness being arranged by a screw which adjusts the rolls; and lastly through a pair of case-hardened rolls, which gives a surface to the plate. The plate is now manufactured; when wanted for use it has to be passed through another description of rolls whilst cold, by which it is either straightened or curved according to its destined employment; and lastly it is sheared and afterwards punched or drilled as necessary.

G. A.

FAIRBAIRN, *On the Application of Cast and Wrought Iron*, 8vo., London, 1854, states the mean breaking weight in the *direction* of the fibre, of plates an inch in thickness, to be 22.51 tons, and *across* the fibre 23.10 tons: the holes for rivets slightly reduce the strength.

The plates used in the Britannia tubular bridge are on the

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bottom—length 12 feet, breadth 2 feet 4 inches to 2 feet 8 inches, and $\frac{1}{4}$ to $\frac{1}{2}$ inch thick; *top*—length 6 feet, breadth 1 foot 9 inches to 2 feet 1½ inches, and $\frac{3}{8}$ to $\frac{1}{2}$ inch thick; *sides*—length 6 feet and 6 feet 6 inches, breadth 2 feet, and $\frac{1}{2}$ and $\frac{3}{4}$ inch thick; they were rendered perfectly flat by pressure, and are framed together with covering plates and angle irons secured by rivets. The plates used in the Conway tubular bridge, a smaller structure, are proportionately less in size and thickness.

Plates of this description are now extensively used in the construction of girders; as covering for roofs; enclosure for houses, CORRUGATED IRON; and in framing in general. One of the numerous machines for punching rivet holes is given in BUCHANAN, *Examples of Modern Tools*, etc., 8vo. and fol., London, 1842, pl. 51. w. h.

BOIS (NICOLAS DU) or DUBOIS, was abbot of the Benedictine monastery of S. Amand, between Valenciennes and Tournay in Flanders. The rebuilding of his abbey church, commenced in 1624, was executed from his designs and under his superintendence: it is described by BLONDEL, *Cours*, 8vo., Paris, 1771, iii, 383. He died in 1673, aged 84 years.

The grand seminaire de S. Sulpice at Paris, designed in 1647 by an architect also called Dubois, is illustrated by BLONDEL, *Arch. Fran.*, fol., Paris, 1752, ii, 43.

BOIS LE DUC, in the kingdom of Holland; its local name is HERZOGENDUSCH.

BOJADA (JOSEF) was engaged with Josef Arbell, after the death of Pedro Blay in 1620, to finish the parish church of Selva, in the province of Catalonia in Spain, which was designed by Jaime Amigo, and was terminated in 1638. 66.

BOJANO (the Latin BOVIANUM, the Samnite town being probably at Pietrabbondante near Agnone, according to MOMMSEN, *Die Unteritalischen Dialekte*, 4to., Leipzig, 1850). A city in the province of Molise in the kingdom of Naples. Some portions of polygonal walling are the only antiquities. The town was rebuilt in the thirteenth century; but the fine Gothic cathedral, dedicated to S. Bartolomeo, was considerably damaged by the earthquake of 1805, and the same fate more or less befel the other public buildings. CRAVEN, *Excursions in the Abruzzi*, 8vo., London, 1838, ii, 160. 96.

BOKHARA. The capital of the khanate of the same name in Central Asia. The town, which is about three miles in length and of an oval shape, is surrounded by an earthen battlemented wall 25 feet high, with eleven gates between circular brick bastions or towers. It has been built around a hill a quarter of a mile square, and about 300 (KHANAKOV says 35 or 40) feet in height, on which are situated the *ark* or palace built by Alp Arslan (1065-72), the residences of the prime minister and several nobles, and three mosques, all enclosed within a wall 70 feet in height constructed of glazed and inscribed bricks. The streets of the lower town are narrow, and are formed chiefly of walls unbroken except by doorways, leading to courtyards surrounded by apartments. The houses generally are not more than one story in height; the smaller ones are constructed of timber frames (made of poplar four or five inches square), which are filled in with sun-dried bricks. The roofs are made of hard wood timbers, boarded and carrying earthen terraces; and the beams, which project beyond the walls considerably, are supported by plates resting on posts, so that the verandah is a very common feature. The few houses erected of brick alone are generally two stories in height. The walls are sometimes plastered on the inside; glass is known, but is never used; the windows, which are sometimes round-headed, being merely openings with shutters, and occasionally filled in with lattices of plasterwork. Near the citadel there is a tower 210 feet in height, from the top of which criminals were thrown, if the native accounts be correct. Among the 360 mosques built of brick, which exist in as many streets, there are only eight of any importance. In the *Meschidi Buland*, said to be 300 feet square with a dome 100 in height, ten thousand persons may be accommodated, if not within the walls, at least

within hearing-distance of the preacher: attached to this is a tapering minaret 180 or 210 feet high and about 25 feet in diameter at the base, which MAYENDORFF, *Voyage d'Orenbourg*, etc., 8vo., Paris, 1826, considered the finest building in the city; the front of the mosque is decorated with blue and white ornamented bricks: the mosque called *Imani Khalifet niaz Kuli* is remarkable for its four minarets covered with blue tiles. The medressehs or colleges, stated to be 100 or even 285 and 365 in number, and attended by ten thousand students, are alike, being spacious courts surrounded by cells or chambers: many of these mosques and colleges are built with stone, although there is no quarry within many miles of the city: the rest are of brick. Accounts differ as to the architectural character of these buildings, which some describe as "splendid and beautiful", while others represent them as having no pretensions except that some of them, such as the *Zergheran*, have façades ornamented with coloured tiles. The medressehs contain from fifteen to ninety chambers each, but the two largest are said to have each three hundred rooms, another has a hundred and fifty, and a fourth a hundred and ten cells. These buildings, with the mosques, the private residences, and the citadel, are supposed to occupy about two-thirds of the city; the other part contains sixteen baths, forty-five or fifty bazaars, some detached shops, and thirty-eight caravanseries (twenty-four being of brick or stone, the rest of wood) which resemble the colleges in having two stories and the windows turned to the street, except that the ground floor is used as shops.

It will be seen that great discrepancies exist in the accounts given of this city; indeed KHANAKOV, *Bokhara*, 8vo., London, 1845, mentioning the thirteen cemeteries within the walls, notices their omission by BURNES, *Travels in Bokhara*, 8vo., London, 1834.

Bokhara is celebrated for the great number of detached country houses, called *Jebaar Baghs*, which surround the town.

BOLCASCOCOE or BOLCASKYEUI, in Asia Minor. The modern name of PEDNELISSUS.

BOLDER, more properly BOULDER, walling.

BOLECTION MOLDING, see BALECTION.

BOLGARY, now also called OUPENSKOI. A town in the province of Kazan in Russia. It contains several remains of the ancient city of the same name, which was the capital of the Bolgars or Bulgars, and the mart of European commerce with Asia before the foundation of Kazan; it became Mahometan in 921-41; flourished till 1350, when it was taken by the khan of Khiva; and was destroyed about 1391 by Tamerlane, who burnt 10,024 buildings, and massacred the inhabitants. STAEBLIN, *Original Anecdotes*, 8vo., London, 1788, p. 145, states that Peter I. examined seventy ruins in 1722, and ordered copies of the Persian and Arabic inscriptions to be made, and the remaining buildings to be preserved by annual repairs: there were, however, not more than forty-four, including eight minarets or towers, remaining at the visit of Catherine II, in 1768. TURNERELLI, *Russia*, 12mo., London, 1854, ii, 218, states that there are not now six of the monuments in existence, but that the walls of an old Russian church contain many Arabic, Armenian, and Tatar inscriptions, from four to twelve centuries old. A leaning tower about 70 feet high, terminating in a cone; and a building having the lower part square and the upper portion octagonal, are near each other, and about a mile distant from a building having a dome lit by an eye, over a circular hall connected with wings of considerable extent. The interior of these wings is divided into several small rooms without windows or apertures for light, and having doors so low and narrow that a child of five years old could scarcely pass upright through them. A large subterranean passage leads from them to a considerable distance, in which coins, vases, and other articles made of gold and silver, have been found. These ruins are named the *baylaya palata* or "white palace": about 600 feet distant is the *ichornaya palata* or "black palace", also called the *soudaisky dom*, or hall of judgment. It is much higher and more ele-

gant than any other of the ruined structures, and the little that remains is fortunately in an excellent state of preservation. The interior has been highly decorated, and in some parts the stucco-work of the ornaments and pilasters is intact. Near this is another tower; and not far from it was the palace of the khans, the ruins of which were destroyed some years ago.

BOLLA (MARCUS, or MAX DELLA) succeeded in 1558 to Nicolas Thuring, who commenced the church of the Holy Cross at Innsbruck. The building was completed by della Bolla in 1563. 26.

BOLLARD (Fr. *poteau d'amarre*). The name given to the posts, either of stone, wood, or iron, which are fixed into the quays of docks or harbours, for the purpose of securing the ropes or chains used to moor vessels alongside. G. R. B.

BOLLI (BARTOLOMEO) was appointed 27 August 1723 architect to the cathedral at Milan. 27.

BOLOGNA (the Latin *BOXONIA*). The capital of the legation of the same name in the States of the Church in Italy. The city is polygonal in plan, nearly two miles in length and about one in width, enclosed by a high brick wall in which are twelve gates, and is divided into "quarters".

Bologna is remarkable among the cities of Italy for the peculiar arrangement of its arcades as the lower story, which prevails in nearly every street; they are agreeable in hot weather, convenient in the cold season, and are always picturesque: these arcades are generally noticeable for the lightness of the columns from which the arches spring. The Palatial architecture is remarkable for the constant employment of the arch and arcade in a variety of very beautiful combinations; in fact, this is the distinctive feature of the Bolognese style. H. B. G.

The houses are well built, generally of brick with tiled roofs, and have parapets towards the street. Noble public buildings, sumptuous palaces, and numerous churches, render Bologna second, in the Papal States, only to Rome.

The *piazza Maggiore*, which is about 370 feet long from east to west, and 300 feet wide, contains the *palazzo Pubblico* to the west, the *palazzo del Podestà* to the north, the church of S. Petronio to the south, and the portico *dei Banchi* to the east. This piazza is also called *del Gigante* from its fountain designed by Lauretti; the pedestal and vase were executed by Lupi; the Neptune or giant and other figures by Giovanni, hence called *da Bologna*; the water is supplied from an octagonal reservoir built in 1564 by Lauretti, and called the *bagni di Mario*.

The cruciform cathedral, dedicated to S. Pietro, has been repeatedly altered, but the greater portion of the present edifice was commenced in 1605, from the designs of the padre Giovanni Ambrogio Magenta. The *capella Maggiore*, designed in 1575 by Domenico Tibaldi, was however preserved in the new building. The structure was not completed until 1748-1751, when the front and the two large chapels next the entrance were added from the designs of Alfonso Torreggiani. The interior, which is of a Corinthian order, is chiefly remarkable for its arrangements: there are double stalls in the apse; a double altar stands in the middle of the choir, that is to say a *retablo* and *contre-retablo* are formed by a wall which stands on the *mensa*; the roof over the middle of the choir is raised to form a *baldacchino* to the altar; there is an organ on each side of the choir; and the pulpit is on the north side. The *bénitiers*, which are ancient, stand upon lions, the work of Ventura da Bologna, who executed for bishop Enrico della Fratta in 1220 "marble lions and figures" for the south portal. The cathedral is 217 feet 6 inches long, 159 feet wide including the chapels, and 131 feet in height. A lofty brick panelled tower stands at the south-east angle of the cathedral. The building which faces the west front of the church was erected under Benedict XIV (1740-58) for the *seminario arcivescovale* in 1751: the portico was designed in 1772 by Francesco Tadolini; the neighbouring buildings, now the *Monte di Pietà*, were constructed in 1757 by Alfonso Torreggiani and his son Antonio.

ARCH. PUB. SOC.

A great portion of the ascertained facts relating to the other churches are condensed in the following list.

Name.	Date, etc.	Architect.
1. Sta. Apollonia	rebuilt 1631	Il Maestro Bortolo (Belli?).
2. S. Bartolomeo di Porta Ravennate	rebuilt 1633	Giamb. Natali, on site of former church built in 1530 by Andrea da Formigine, whose portico was preserved.
3. S. Benedetto	rebuilt 1600	Giambattista Ballerini.
4. S. Carlo alla Via Nuova, and accompanying bldgs.	blt. about 1740	Gius. Ant. Ambrosi.
5. S. Carine .....	.....	Nice. lo Savelli.
6. Sta. Caterina di S. Maria in Vico	rebuilt 1810	Vicenzo Brighanti.
7. Sta. Cecilia (secularized)	rebuilt 1810	With square chancel and triple western gallery.
8. Corpus Domini or delle Santa, or Sta. Caterina dei Francescani	finished 1648	Giovanni Giacomo Monti.
9. Sta. Cristina	rebuilt 1602	Giulio Torri.
10. S. Domenico	modernized 1730	Francesco Dotti, who also did the two cloisters.
11. S. Francesco	built	Marco Bresciani, and in it the capella Lombardi Malvezzi, blt. about 1530 by Andrea da Formigine.
12. SS. Giacomo e Felice ..	built 1641	See below.
13. S. Giacomo Maggiore dei Augustiniani	rebuilt 1788	Giuseppe Tubertini.
14. S. Giulio	rebuilt 1788	See below.
15. S. Giovanni in Monte ..	rebuilt 1788	Angelo Venturoli.
16. S. Giuliano	rebuilt 1778	Francesco Martini.
17. SS. Giuseppe ed Ignazio Conservatorio delle putte ..	rebuilt 1646	See below.
18. S. Isola	rebuilt 1621	Sebastiano Fiorini.
19. S. Leonardo	17th century	Antonio Uri.
20. Sta. Lucia	built 1623	Giuliano Rainaldi.
21. Madonna dell'Impegnazione ..	built 1700-30	Francesco Angelini.
22. Madonna dell'Impegnazione ..	built 1700	Francesco Rossi.
23. Madonna di Porta	built 1700	Marc Antonio Bianchini.
24. Madonna del Soccorso ..	built 1581	Antonio Laghi.
25. Madonna di Galliera	rebuilt 1478	Domenico Pellegrino Tibaldi.
Magnificent oratory (No aisle, but chapel) ..	about 1760	Remodelled entirely in 1688 by Giambattista Torri.
26. Sta. Maria Addolorata dei Servi ..	built 1781	Alfonso Torreggiani.
27. Sta. Maria della Vita ..	rebuilt 1686	Andrea Manfredi.
The cupola	finished 1787	Giamb. Borganzoni.
28. Sta. Maria delle Lanzi, or Compagnia dei Poveri ..	modern, 1806	Gius. Tubertini.
29. Sta. Maria Labarum Coeli or la Baronella ..	rebuilt 1740	On designs left by Dom. Tibaldi.
30. Sta. Maria delle Murtelle ..	rebuilt 1680	Fran. Tadolini.
31. Sta. Maria Maddalena Parrocchia ..	rebuilt 1772	Angelo Venturoli.
32. Sta. Maria Maggiore	modernized in 1600-80	See below.
33. Sta. Maria della Pietà, or i Mendicanti ..	rebuilt 1600-80	Gius. Ant. Verardi.
34. Sta. Maria della Purificazione, or della Massarella ..	rebuilt 1700	Francesco Dotti.
35. S. Martino dei Carmelitani ..	rebuilt 1813	Raimondo Compagnini.
36. S. Mattia	rebuilt 1585	Raimondo Compagnini, from the design of Alfonso Torreggiani.
37. S. Michele de' Leprosetti ..	modern, 1765	1605, 1707, 1750.
38. S. Nicolo degli Albani ..	built 1680	Il Maestro Bortolo (Belli?).
39. S. Nicolo di S. Felice ..	rebuilt 1570	Luigi Casoli.
40. S. Paolo	rebuilt 1611	See below.
41. S. Petronio	rebuilt 1611	Pietro Fiorini.
42. S. Pietro Martire	rebuilt 1586	Andrea Chiesa.
43. S. Procolo	rebuilt 1586	Nicolo Barilli.
44. S. Prospero	rebuilt 1739	Pietro Fiorini.
45. S. Salvatore	rebuilt 1739	See below.
46. S. Sigismondo	rebuilt 1739	Giov. Ambrogio Magenta.
47. Sta. Sofia	rebuilt 1748	Carlo Francesco Dotti.
48. S. Spirito	rebuilt 1665	Angelo Venturoli.
Collegio	rebuilt 1748	Gius. Ant. Ambrosi.
49. S. Stefano	rebuilt 1748	See below.
50. Delli Trentatre	rebuilt 1739	Giu. Jarmorini.
51. Church and conservatorio delle putte di S. Gioacchino ..	rebuilt 1820	Alfonso Torreggiani.
52. The church della Carità of the Franciscan monastery, which was converted into a military hospital in 1798, but in 1709 became parochial, was built 1583 by Pietro Fiorini.		Gius. Ant. Ambrosi.

No. 10, S. Domenico, has been modernized, but the west front, and the rich panelled square tower with a heavy cornice, pinnacles at the angles, and a spire, appear to be intact. It has double stalls behind the altar and round the apse, with a kind of throne; there are two organs in the choir, and two more in the north transept; the chapel by Terribilia is given in *Illustrations*, plate xxx; the cloisters and the tombs, dating from the thirteenth century, are worthy of notice: the piazza contains the canopied tombs of the Passagieri and Foscherari 1280-90. No. 11, S. Francesco, the subject of a description in the *ECCLÉSIOLOGIST* for 1845, iv, 287, when it was restored by Antolini,

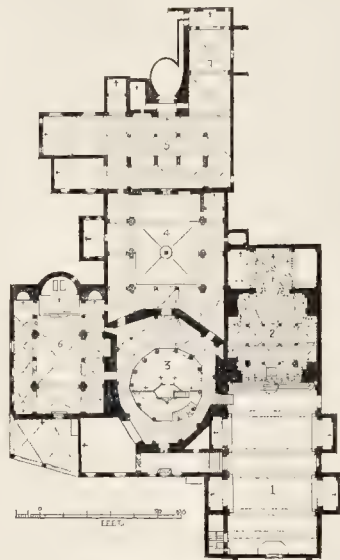
was used from 1798 as the *dogana* or custom house; it is chiefly remarkable for the use of brickwork throughout its construction, even in the piers of the nave and in the flying buttresses to the nave and choir; the choir has a seven-sided apse and a lady chapel (modern) at the east end; there are attached chapels of various epochs to the aisles and transepts, which latter did not originally extend beyond the aisles. No. 13, S. Giacomo Maggiore, is said to have been built in 1267; it was enlarged 1285, and vaulted 1497, and has been much modernized, but the nave, choir, and three-sided apse, with the surrounding chapels, are not yet complete; the head of the apse is ornamented with the *shell* of S. Iago; the apse contains the stalls; the altar is a molded slab resting upon three columns; there are two organs; the Bentivoglio portal has shafts resting upon monsters; the Poggi chapel was designed by Pellegrino Tibaldi; the semicircular vaulted roof of the nave has no buttresses; there is a fine staircase by Alf. Torreggiani to the adjoining former monastery. No. 15, S. Giovanni in Monte, built in a Pointed style about 1221 according to local tradition, was modernized in 1824; each bay of the aisle has a chapel formed by two arches springing from a pier in the middle of the aisle arch; the transepts form at the intersection a central octagonal cupola, and each transept has an organ; there are no windows to the aisles, and the chancel has a square termination. The adjoining monastery, now a prison, has cloisters designed by Terribilia in 1548. No. 26, Sta. Maria Addolorata, furnishes another instance of a seven-sided apse; the altar is under the choir-arch, and the stalls are behind it; the large round western window, with the fine wide loggia round the church, are interesting; a cornice, 1392, is given in *Illustrations*, pl. xvii. No. 35, S. Martino, is a splendid church, and contains the handsome Saliceti tomb in its cloister designed in 1403 by Andrea da Fiesole. No. 40, S. Paolo, was built by the Barnabite Fathers, but part of the façade was designed by Ercole Fichi; the church has stalls in a semicircular apse behind the altar, a dome and a coved roof. No. 41, S. Petronio, commenced 7 July 1390 by Antonio Vicenzi or di Vincenzo, is 184 feet wide by 437 feet long, of six bays only, and 147 feet high; if the choir and transept had been built, the edifice would have been 712 feet in length, or a hundred feet longer than S. Peter's at Rome; it has a temporary wooden apse with double stalls, and an altar facing east and west, as in the *duomo*, and an organ on each side; there is no triforium, but a large octofoiled window is introduced in each bay of the nave and aisles. Each bay has a chapel, entered from the aisle by two arches springing from a pier in the middle of the aisle arch; the pavement is formed of tiles of which the age is unknown; the wardens of the fabric preserve twenty-one designs for the façade by the most eminent architects, which is still unfinished, being a brick wall with some marble ashlar; the building is considered a pure specimen of Early Italian Gothic art; a view of the nave is given in WILLIS, *Remarks*, etc., 8vo., Cambridge, 1835, pl. 6. No. 43, S. Procolo, contains a fine tomb in a chapel designed by Alfonso Torreggiani. No. 45, S. Salvatore, has stalls in a semicircular apse behind the altar.

No. 49, S. Stefano, is generally called the "seven churches". The plan here given exhibits the connexion of the buildings, but it is difficult to rely upon the names given to them, as changes seem to be made from time to time.

1. The church of S. Stefano, or SS. Crocifisso, a Romanesque edifice with a raised choir, out of which stairs lead to the Banzi chapel.
2. The chapel called i Confessi, or S. Lorenzo, or S. Spirito, as well as SS. Vitale e Agricola; the confessional or crypt to No. 1.
3. The baptistry, ix cent., now called S. Sepolcro, or il Calvario, having a dodecagonal body with an aisle round it, and a curious gallery and ambo, illustrated by GALLY KNIGHT, *Eccles. Arch.*, i, 20, where the pulpit of the eighth (?) century is also shown as a vignette. The columns are said to have been taken from a temple to Isis. There is an anonymous work on this building, entitled *Della Chiesa del S. Sepolcro*, 4to., Bologna, 1772.
4. The Corte or Atrio di Pilato, 1393, a cloister with chapels on the sides,

and two rows of galleries, the upper one having antique columns: the adjoining hall was built under pope Benedict XIV (1740-58).

5. SS. Trinità, a sort of two-aisled crypt with an altar of red marble, consisting of a *mensa* without moldings, standing on a pair of shafts at each corner of one central column.
 6. SS. Pietro e Paolo, or del Crocifisso, a Romanesque basilica with nave and aisles ending in semicircular apses; the nave arches enclose two aisle arches.
 7. S. Giovanni del Crocifisso.
- Another cloister and a lofty square campanile are contained within the precincts.



Plan of S. Stefano, from DALL'ACQUA.

The *palazzo Vecchio*, or *del Comune*, or *del Podestà*, commenced in 1201, now contains the archives and the college of notaries; the great hall, 170 feet long and 74 feet wide, called the *sala del Re* (Enzio) was in existence before 1250; the tower built 1264 and called the *torrazzo dell' Aringo*; and the façade designed by Bartolomeo Fioravanti in 1485, are the leading features of this edifice. The *palazzo Maggiore* or *Pubblico*, the residence of the papal legate and the senator, has been much altered since its commencement about the close of the thirteenth century; it contains a grand staircase a *cordoni* designed by Bramante, and the chapel 64 feet long by 32 feet wide "of an immense height", by Alessi about 1570, who also designed the entrance from the piazza to the first cortile which was superseded by Tibaldi's; the façade on the left hand in the cortile is by P. Canali; that facing the entrance is by S. Serlio: the *Carceri del Torrione* are at its north-west angle; and facing them on the north was the old *dogana pubblica*. The *palazzo Arcivescovale* built in 1577 by Tibaldi on the north side of the *Duomo* has also been restored and somewhat recently decorated. The *registro* or old college of notaries which was built about 1256, stands next to S. Petronio; the great hall is now converted into a chapel. The *Mercanzia* or *palazzo della Mercanzia*, also called the *foro dei Mercanti* when it was built in 1294, which serves as an exchange, chamber of commerce, court of bankruptcy and tribunal of arbitration, was enlarged in 1337 and in 1380, and was restored under the Bentivogli (before 1402); the principal façade, given by GALLY KNIGHT, *Eccles. Arch.*, fol. London, 1842, ii, 40, is considered to be one of the best preserved specimens of Italian Pointed architecture; it was executed in 1439 and has a *ringhiera* or balcony under a pinnacled canopy. This is one of the buildings which exhibit the successful use of terracotta or molded bricks. The *Zecca* or mint was placed in an

old edifice with a new façade designed in 1578 by Terribilia; Domenico Tibaldi designed a *palazzo della Gabella*, now the *palazzo Mattei* since 1801.

The finest palazzi in Bologna, taken as nearly as possible in chronological order, are, the Bevilacqua, said to owe its magnificent cortili, halls and staircases to Bartolomeo Suardi of Milan; Magnani now Guidotti by Domenico Tibaldi (1541-83), and Pepoli (1844), modernized by G. A. Torri (1676-1730). The palazzo Ranuzzi now Baciocchi is probably rightly esteemed one of the most magnificent of its class; for the façade is by Palladio, the great hall by one of the Galli, and the handsome staircase by Torri, not Giambattista Piacentino. The palazzo Ercolani, which was restored at the close of the last century from the designs of Venturoli, is worthy of particular study; the gallery round the staircase, which was designed by Carlo Bianconi, is one of the means of effect which are rarely placed at the disposal of the architect; *Illustrations*, pl. xxxviii. Palazzi of less importance, but whose architects are known, are the Malvezzi-Campeggi built by Andrea da Formigine (about 1530); Leoni, now Sedazzi, with a façade by Girolamo da Trevigi (1508-1544); Albergati, by B. Peruzzi (1481-1536) to which the date of 1540 is assigned by some authors; Stracaiuoli or Draper's Company, now the Grand' Albergo Svizzero, attributed to Francesco Francia; Bocchi, now Casa Piella, designed in 1545 by G. Barozzi; Marescalchi by one of the Tibaldi; Zani, afterwards Odorici, now Biagi, by F. Ambrosini (1620), the interior by the Ambrosi; Aldrovandi, nearly rebuilt by the Conte Pompeo Aldrovandi in 1748; Lambertini, now Ranuzzi, designed by B. Triacchini; and Agucchia Giavarina, rebuilt by F. Dotti (1740); besides these, mention should be made of the Bolognini, now the *casino*; Zagnoni, now Spada, built by F. Tadolini; Fibbia, afterwards Fabri, now Pallavicini (*Illustrations*, pl. lviii); Fantuzzi, by F. Formigine, with a handsome staircase by P. Canale; Malvasia, now Manzoli, rebuilt by F. Tadolini; Caprara, now Beauharnois (1703), designed by Alfonso Torreggiani, the staircase by A. Laghi; Malvezzi Leone, by F. Tadolini; Conti, modernized by G. A. Ambrosi; Bianci, by G. A. Ambrosi, with a private staircase by C. Bianconi; San Giorgi, by F. Santini; Cappelletti, now Naldi, by G. Martinetti (1794); Pietramellara, now Rusconi, the portico by Venturoli; Zambecari, the façade by C. Bianconi (1775); Belloni, now Sora Munarini, by G. A. Torri; Cappi, now Cataldi, by G. Bassani; Bianconi, now Vaccari, by R. Compagnini, who also designed (1773) the Tubertini, now Cappi; Stella, now Levi, by F. Tadolini (1771); Merendonì, now Insom, by R. Compagnini (1773); Orsi, now Borghi, by F. Terribilia; Legnani, rebuilt at the end of the seventeenth century by G. Chellini; Bargellini, by B. Provaglia; Malvezzi Medici, by B. Triacchini; Banzì, rebuilt by F. Antolini (1819); Isolani, by G. A. Torri; and Savini, now Segni, having a curious staircase, by G. C. Galli Bibiena; the Casa Berti, by G. Verardi (1775); the Casa Rossini, by F. Santini (1825); and the Casa Schiassi, now the Academy of Fine Arts, by G. Bartoli.

The well known towers, built about 1109 and 1110, are illustrated by GALLY KNIGHT, *Eccles. Arch.* ii, 2. The *torre degli Asinelli*, which is said to have been shortened 156 feet after the earthquake in 1416, is now 299 feet 3 inches high to the top of the battlements: it is 26 feet square at the lower part, 22 feet 8 inches at a height of 110 feet, lessening to 21 feet 2 inches at the underside of the battlements, where it is 15 feet square in the interior: the building at the base forms a square of 51 feet (measurements taken by T. L. Donaldson in 1822). The axis is said to incline 6 feet 2 inches westward. The *torre dei Garisendi* is about 162 feet high, whence it is popularly called *la Mozza*, "the Maimed"; it is 23 feet 9 inches square and does not taper, and inclines 10 feet eastward and 3 feet 9 inches southward. There were many such towers, which are named by BENACCI, *Nome delle casate strade et torri di Bologna*, 1504. The belfry tower called *della Maggiore*, which was moved 35 feet by Aristotile Alberti in 1455, was demolished in 1825.

The theatre called the *Arena del Sole* was built in 1810, from the designs of Carlo Asparri; the Comunale was designed by A. Galli Bibiena in 1756, and opened in 1763, but it has been much altered; the Contavalli was built by G. Nardi in 1814, in the suppressed Carmelite convent of S. Martino Maggiore; but the old staircase by Bart. Provaglia was preserved; the Corso was designed by Santini in 1805. A *casino* or assembly room is established in the palazzo Bolognini; and there are two musical societies. The educational establishments are an Academy of Fine Arts, occupying the *collegio* of the Jesuits; and fifteen scientific institutions, many of which are attached to the Università Pontificia. The palazzo which contains the university, the institute of sciences, and other similar establishments, was purchased in 1714 by the Senate to receive the bequests of count Marsigli, which included a museum of antiquities, a rich cabinet of natural history, and a library of 150,000 volumes; the library of the university since 1803 is in a building designed by Carlo Dotti (1740-1758); the university itself has occupied the palazzo with its noble chapel formerly belonging to the Poggi, afterwards to the Celesi, and still more lately to the Banchieri, families; the exterior was designed by Pellegrino Tibaldi and executed by Alessi; the cortile is the work of Bartolomeo Triacchini. The name of the building quitted by the university in 1803-8 was the *Scuole* or *Studio pubblico*, it is now occupied by the *Scuole pie*, which were formerly in a building still more to the south of the piazza Maggiore; the old university, 300 feet in length, and considered to be one of the finest architectural works in Bologna, was designed by Terribilia in 1562, but the credit of the work has been generally given to Barozzi. To these may be added the *oratorio* or *scuole*, with a grandiose portico, of the Confraternità della Croce, erected by Niccolò Barelli (1766); the Conservatorio delle Putte and church of S. Giuseppe by Martini; and the colleges for particular purposes, such as that founded by Count Carlo Zani in 1645, which occupies a palazzo built by Torreggiani; and that for architecture called after its founder Venturoli, who placed it in the Hungarian college, built by Giambattista and Giuseppe Antonio Torri, and completed by G. A. Conti in 1700; the collegio di S. Luigi by Terribilia; and that of Poeti, built 1774, and restored by Venturoli. The *ospedale grande* (1667-1725); and the *ospedale di SS. Pietro ed Procolo, or dei Bastardini, or de l'Esposti*; the foundling hospital, once the Benedictine monastery of S. Procolo, with a chapel designed externally by Chelini; the *ospedale de' Convalescenti* with a portico added in 1589 by G. Ballerini; and the *ospedale Azzolini* (1706, enlarged 1768), complete the list of important public buildings.

The principal gateways are the *porta* di Strada Maggiore, erected in 1770 by Gio. Gia. Dotti; the *porta delle Lamme* in 1661 by Agost. Barelli; the *porta* di Galliera, rebuilt on the design of Bart. Provaglia; and the *porta* Pia by Fiorini.

The Bolognese architects consider the porticos dei Banchi and dei Servi the finest of the features of the same kind which decorate the interior of the city. The portico dei Banchi, which is 300 feet in length, runs under the building by Barozzi which bears the same name. The architect had to preserve the old portico which was very low, two streets, and an immense number of windows looking into that square. In the original design were two small towers rising from the arches which cross the street, but these were not executed. The portico dei Servi to the church of Sta. Maria Addolorata was built in 1392 by Fra Andrea Manfredi of Faenza, the general of the Order, who also designed the church in 1383 and the stalls; there is a fine staircase by Terribilia in the monastery.

The portico degli Scalzi, from the *porta* Maggiore to the church of SS. Omobono ed Aldobrando, contains 167 arches, and is 1,700 feet in length. The portico from the *porta* di Saragozza to the church of the Madonna di S. Luca on the Monte della Guardia, begins at the arch built in 1675 as a propylon by Giovanni Giacomo Monti; it contains 635 arches, and is little less than three miles in length; ARCADED PORTICO,

Illustrations, xl. It was finished in 1739. The church itself was rebuilt by Carlo Francesco Dotti in 1731.

The Certosa or Cimitero Comunale, built 1330-67, has a portico commenced by Gasparini (H. 1815) to the porch of the church erected by Giac. Gio. Dotti in 1768; it was converted into a cemetery in 1802.

The botanical gardens have occupied since 1804 the site of the collegio Ferrario dei Piemontesi; the old building for the hot-houses was designed by Francesco Tadolini. The lecture room is in the Palazzino della Viola, formerly a villa of Giovanni Bentivoglio II.

Outside the town are the following churches: the Misericordia, rebuilt in 1511; S. Michele in bosco, built between 1437 and 1454, formerly belonging to the suppressed monastery of Olivetines, perhaps the finest of the monastic establishments in Italy; the dormitory was 427 feet in length; the cortile was designed by one of the Fiorini, and the library was designed by Giovanni Giacomo Monti; the doorway by Peruzzi is given by DONALDSON, *Modern Doorways*, 4to., London, 1836, pl. 21-3. The Madonna di Mezzaratta is said to have been built in 1106. S. Paolo was designed by Vannini. The exterior of "Le Acque", a church to SS. Girolamo ed Eustachio, was commenced by Girolamo Rainaldi in 1628.

The canal called *il Naviglio*, commenced in 1191, was completed by Barozzi, who planned and executed the three last miles which connect it with the city.

In the environs are several churches with square towers and open belfry stages, which afford good hints; some have pear-shaped lanterns; and one or two have spires. The church of Sta. Maria Coronata at Puratelli is remarkable for having no western door, but only a grated hagioscope; there is also an octagonal lantern to this church.

ZECCHI, *Collezione dei Monumenti Sepolcrali del Cimiterio*, etc., 4to., Bologna, 1825-27; and *Descr. della Certosa ora Cimitero*, 8vo., Bologna, 1828; DAVIA, *Le Sculture delle Porte della Basilica di S. Petronio*, fol., Bologna, 1834; LANDI, *Palazzi e Cortile di Bologna*, fol., Bologna, n.d.; ZANOTTI, *Storia dell' Accademia Clementina*, etc., 4to., Bologna, 1736-9; *Pitture*, 12mo., Bologna, 1686; MALVASIA, *Pitture*, 12mo., Bologna, 1766; BIANCONI, *Guida del Forestiere*, 12mo., Bologna, 1826; CANCELLIERI, *Notizie Istoriche*, etc., 4to., Bologna, 1823; MAGAZZARI, *Raccolta de' piu scelti Ornati sparsi per la Città di Bologna*, obl., 4to., Bologna, 1827.

BOLOGNA (ARDUINO DA) began in a Pointed style in 1390 the church of S. Petronio in Bologna, according to HAGEN, *Briefe in die Heimat*, 12mo., Breslau, 1818, ii, 176. This statement is founded upon the appearance of the name upon a model of the building made 1514 by Arduino Arriguzzi, architect to the fabric, who died in 1531. 105.

BOLOGNA (FRA BENVENUTO DA), a lay brother of the Dominican order, was probably engaged during part of the fourteenth century in the continuation of the works at the church of SS. Giovanni e Paolo in Venice. The church of S. Agostino in Padua, commenced in 1226, was finished in 1303 under his direction: it was destroyed in 1822. In 1314 he was engaged by the magistracy of Bologna to improve the canal between that city and Ferrara. MARCHESI says explicitly that FEDERICI, finding that a Franciscan lay brother named Fra Benvenuto was practising architecture in Treviso, mistakes him for another friar of the same name, the architect of the church of S. Niccolò in Treviso, and who according to GHIRARDACCI was a Dominican: this church was probably commenced between the years 1310 and 1315, and was considerably advanced in 1318, when the works were suspended until they were resumed in 1352 under Niccolò da Imola, who is also supposed to have been engaged on the above-named church in Venice, whence the two Dominican friars may be supposed to have been the same person. 87.

BOLOGNA (BORTOLO DA) is called BORTOLO BELLI by ZANI, *Enciclopedia*, iii, 179; and states that he was born in

1610 and died in 1676. He was architect to the government, and rebuilt in 1631 the church of Sta. Apollonia, and in 1680 vaulted and completed that of Sta. Maria della Pietà, called i Mendicanti, in Bologna. 94. 105.

BOLOGNA (FRA DOMENICO DA) is mentioned as an architect in the *Annali Dominicani di Bologna*, and by VANNINI. 87.

BOLOGNA (GIOVANNI DA), born at Douay in 1529 (about 1524, GINORI), was a pupil of the sculptor and engineer Jacques de Breuck (Jacob Beuch in GINORI, Giachus Bregamenga in Lomazzo, *Trattato*, 4to., Milan, 1585, p. 688), and afterwards went to Rome, where he studied the works of Michel Agnolo Buonarroti. His reputation as a sculptor caused him to be made cavaliere di Cristo in Portugal, and chief sculptor to the grand dukes of Tuscany. As an architect he designed at Florence the façade of the house of his earliest patron, Messer Bernardo Vecchiotti da' Ferravecchi, in the Cantonata; remodelled in 1580 (MARCHESI, 1540 GINORI) the interior of the church of S. Marco; added in 1587 the Salviati chapel to it; and erected behind the high altar in the church della Nunziata a chapel to serve as his own tomb. The epitaph, fixed by himself in 1599, is given by the COMMISSION ROYALE DE L'HISTOIRE, *Comte Rendu*, 8vo., Brussels, 1848, xiv, 547, 558. He died 14 August 1608. 30. 87.

BOLSENA (the Roman VOLSINI). A city in the States of the Church in Italy. A few caves, now hardly to be recognized as tombs, are all that remain of the Etruscan town, which was razed by the Romans. Bolsena, however, is not deficient in altars, sarcophagi, Corinthian capitals, and broken columns, some of which are of granite. ADAMI, *Storia di Volseno*, 4to., Rome, 1737, described and delineated most of the remains then existing. The sumptuous triple church dedicated to Sta. Cristina, and formerly a cathedral, was rebuilt by pope Urban IV (1362-1370). A parish church; the Rusticucci palace, built before 1600; and some monastic establishments, are all the buildings of importance in the place, which was restored to the rank of a city by a papal bull in February 1828. Antonio da San Gallo built two small temples on the larger island in the lake. DENNIS, *Etruria*, 8vo., London, 1848, i, 507.

BOLSOVER. A village, formerly a market town, in the hundred of Sealsdale and county of Derby. The church is of the Early English mediæval architecture, with some curious earlier sculpture; and there is a fine castellated mansion built in the reign of James I. The stone, procured from quarries on the spot, is a semicrystalline magnesian limestone, of a light yellowish-brown colour, found in beds from eight inches to two feet thick. The perfect condition of the masonry in the nave of Southwell minster, which is said to have been built with a similar stone, of Bolsover church, and of the castle above mentioned, led to its being recommended for adoption in the *Report, etc., of the Commission to Inquire into the Qualification of Stone, etc., for Building Purposes*, 2nd edit., 4to., Lond., 1845. w. u.

BOLSTER. A name given to the BALUSTER or cushion portion of an Ionic capital.

BOLSTER. A piece of timber placed across the ribs which form the centering of arches, so as to support the voussoirs. The same term is given to wooden corbels used in the construction of timber bridges; BREESE, *Glossary*, 8vo., London, 1853.

BOLSTER WORK (It. *pulvinata*; Sp. *almohada*, *almohadillo*; Fr. *bombe*). The term used (as well as cushion, or pillow, work) in reference to the bellied profile which is seen in friezes employed at different times in the Ionic, Corinthian, and Composite orders; and also in each course of a rusticated stone wall; especially in the aqueducts and bridges built by the Romans.

BOLT. A piece of wood cleft with wedges in order to be split into other thinner pieces for laths. Also a bundle of reeds prepared for thatching. Also a stack of bricks piled ready for use before a building. A. A.

BOLT (It. *caricchia*; Fr. *boulon*; Ger. *riegel*, *nagel*). A piece of wrought iron generally round, but sometimes flattened

at one end, when it is termed a *strap bolt*, and is employed for various purposes of connexion and suspension. It is formed with a knob (Fr. *tête*) either hexagonal, square, or button-headed at one end, and a screw (Fr. *filet avec écrou*) at the other. The screwed end being passed through a hole made in two or more pieces of the material to be bolted together, receives a nut (Fr. *pas-de-vis*). When applied to two surfaces of iron, the head and nut are generally sufficient of themselves, but when applied to timber a thin piece of iron called a washer (Fr. *rondelle*) is applied against the surface of the wood, for the purpose of preventing the material being forced or injured in the operation of screwing up, or when subjected to strains. In nut and screw bolts of some length, the best practical engineers thicken out the bolt at the screw end, that the strength of the bolt may not be reduced when cutting the thread. H. B. G.

WEIGHT OF IRON BOLTS AND NUTS (By F. Mulholland, in *BUILDER Journal*, iv, 22).

Diameter of bolt	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	5	6	7	8	9	10	11	12
Weight per lb.	10	15	20	25	30	40	50	60	70	80	90	100	110	120	130	140	150	160
Foot of round iron	2	4	7	1	1	2	2	3	4	4	5	6	7	8	9	10	11	12
Weight of 1 in. of round iron	0.10	0.33	0.58	0.83	1.25	1.68	2.25	2.83	3.50	4.16	5.00	5.83	6.67	7.50	8.33	9.17	10.00	10.83

At present bolts are often made with square heads, so that these being let into the timber, the stem cannot turn while the nut is being screwed up. BROWN, *Engravings of Locomotives, etc., Nuts, Bolts, and Washers, &c.*, Sheffield, 1848.

The term **BOLT** was formerly applied by carpenters to a square wooden bar or rod (Fr. *moise*) used for the same purpose, and fastened by a key or wedge (Fr. *clef, clavette*) passed through the keyhole at each end. **BOLT** or **BED BOLT** in carpentry is a bolt made to connect the timbers of a roof, and so contrived as not to show from below. A hole is bored lengthwise through the timber, the bolt is inserted, and the nut, which is round with cross notches, is driven tight by blows of a hammer against a blunt chisel. The hole through which this is done is afterwards filled up with a piece of wood. A. A.

The name of **BOLT**, or rather *window-bolt* or *round bolt*, is also given to a pin, generally round, with a large head at one extremity and a slit at the other end to receive a wedge, smaller pin, or *forelock*, which is the customary way of fastening iron shutter bars and shutters. Sometimes both ends are made to receive pins or wedges, but the name of bolt (Fr. *moise*) was still retained, even if the bolt, as in old buildings, was made of wood.

BOLT is also the general term for several sorts of fastenings in which a piece of metal is moved, either by the hand or by a spring. The commonest bolt is a *bolt with staples*, the latter being driven into the door form the collars in which the bolt runs. A *rough rod* or *round bolt* is a bolt confined by curved plates which are not continuous enough to form a barrel; a *bright rod bolt* is the same with the bolt polished; a *barrel bolt* has a rod which slips along a barrel; a *plate bolt* has the bolt square and inserted in a groove under a plate; and a *flush bolt* has a square or round bolt moved in a groove or barrel fixed at the back of a plate in which is a slit for the handle of the bolt to traverse; the surface of the plate when fixed being flush with the adjoining work. The flush bolt for doors is often half rabbeted. A *spring plate bolt* is a flush bolt with a spring behind the bolt to keep it up to its work. A *neck bolt* has the bolt forming a bend at right angles at one end, and confined in the same manner as the *round bolt*; it is now seldom used. ESPAGNOLETTE. 1.

BOLT OF A LOCK. The portion of a lock that enters the jamb or staple or box staple when the leaf of the door is closed. The best kinds of locks have three bolts; the knob, or handle, or *spring bolt*, which is ground so as to enter of itself the staple when the door is shut; the *dormant* or *lock bolt*, which only acts when moved by the hand or key, as in ancient examples; and the *private bolt*, which shoots with a smaller knob than the first-named bolt, but without a spring. The best of the two former class of bolts have SCOTCH SPRINGS. All external doors should have brass bolts, to prevent rust. A. A.

ARCH. PUB. SOC.

BOLT AUGER. A large auger used in preparing the holes for bolts through large timbers. A. A.

BOLTEL, BOTTLE, BOULTEL, BOULTIN, BOUTEL, or BOWTEL (Fr. boudin). A molding of which the profile was formed of a portion of a circle; HOLMES, *Academy of Armory*, fol. Chester, 1688, 472, employs it both for a quarter-round and a semicircle. It was the old term not only for a torus, but for any other rounded molding, such as the quarter-round in the capital of the Italian Doric orders. WILLIS, *Architectural Nomenclature*, 4to., Cambridge, 1844, observes that in Pointed architecture "the shaft of a column was sometimes called a bowtell, but rather as a molding than as a diminutive pillar or columnel." 4.

BOLTON (WILLIAM) was made prior of the monastery of S. Bartholomew, at Smithfield in the city of London, about 1506. He is supposed to have designed the chapel of Henry VII at Westminster abbey, because in the will of that sovereign, dated 1509, he is designated as "master of the works"; STOW, *Survey*, etc., fol., London, 1720, iii, 235, mentions his works at his monastery; its manor of Canonbury at Islington; and at his parsonage of Harrow on the Hill, where he died 15 April 1532; WEEVER, *Funereal Monuments*, fol., London, 1631, p. 434. The rebus of a bird bolt passing through a tun is well known.

BOLT PLATE. The name given to a contrivance inserted in a floor to receive the bolt of a pair of folding doors. The usual form consists of a metal plug resting on a spiral spring inclosed in a tube; the plug gives way before the bolt as it is pressed down, and rises again so as to close the hole as soon as the bolt is raised. This, however, gets out of order by dust dropping into the tube. A modification was invented by B. Holmes, which is described in SOCIETY OF ARTS, *Transactions*, LII, pt. i, 233, as consisting of a bent arm fixed to the underside of the floor boards, carrying a plug which is kept in its place by a spring; any dust falling through descends into the space between the joists.

BOMARZO. A village about twelve miles east of Viterbo in the Papal States. It is celebrated for the remains of Etruscan aqueducts or sewers, formed by pointed vaults 8 feet high by 2 feet wide; and for tombs which are described by DENNIS, *Cities, etc., of Etruria*, 8vo., London, 1848, i, 212. The most important of these is the *Grotto della Colonna*, which has a massive pillar supporting a curved ceiling. LENOIR, in the *Annali dell' Instituto*, 8vo., Rome, 1832, p. 269, mentions several other tombs with similar pillars having been found upon this site. The unique sarcophagus inscribed Vel Urinatis, now in the British Museum, was discovered here in a chamber called the *Grotta Dipinta*, the only painted tomb as yet found in this necropolis; not more than 1 in 400 or 500 of Etruscan tombs being so decorated. DENNIS also observed one tomb which was circular with a central column, as at Volterra.

BOMBAX CEIBA (muh mien). The wood of the cotton-wood tree obtained in China. 71.

BOMBAY (the Portuguese *Bom-bahia*, or Good Harbour). The capital of the presidency of the same name, and since 1837 the seat of a bishopric. The city properly so called is situated on the eastern shore of the island of the same name on the west coast of Hindostan. Within the walls are a church, now the cathedral, dedicated to S. Thomas; the old government house, which has ceased to be the abode of the governor, but is now occupied as public offices; and the town hall, which is called "magnificent", and contains, besides one room of noble dimensions, the library and museum of the Bombay branch of the Royal Asiatic Society: it stands in the centre of the fort, on Bombay green, a spacious enclosure, also containing a statue of the marquis of Wellesley. The chief other buildings in the island are the governor's residence at Perelle; three English Protestant churches; several Portuguese and Armenian churches; three or four synagogues; many Mahommedan mosques and Hindoo temples, especially that of Mahaluxmee, and on Malabar hill, the western point of Back bay (at the back of the fort)

are the remains of a large pagoda; the old kirk or Scotch church, a modern building with a lofty spire; the Free (Scotch) church recently erected near the Elphinstone college; two barracks; the arsenal; the mercantile buildings; the mint; the court house, a handsome edifice, the internal arrangements being large and convenient; the post office; the custom house; and several banks; the hospitals, especially the Jamsetjee Jeejeebhoy hospital (Gothic), opened 1845, with 300 beds; and the Grant medical college, which adjoins it so closely as to look like a continuation of the same structure. About two miles south of the fort are one of the hospitals, the lunatic asylum, and the lighthouse.

North of the fort is the esplanade or parade ground, which is occupied in the hot season by the tents of the Europeans, who in the winter reside, like the natives, chiefly in *bungalows*, which extend for four or five miles northward of the town. They are of one story; the street door opens into a large saloon with a ceiling supported by pillars, and this room is divided by curtains from the dining room. Each person has a bed, dressing, and bath room; and one or all of these usually open upon the verandah which surrounds the house, and is indispensable in the poorest abode. There are, however, several English lofty mansions, with façades adorned by porticos of sufficient width to admit *two* carriages abreast. The internal arrangements are much the same as in England: the ground floor contains the dining and breakfast rooms, library, etc., and often one or two suites of apartments as guest chambers. The wide and handsome staircases conduct to the reception and family rooms; and often there is a room under the verandah over the balustraded roof of the portico. To promote the circulation of air, the partition walls are generally constructed of Venetian blinds. Between the esplanade and the race course is the new, native, or black town, which chiefly consists of houses of two stories in height; the lower ones being open shops, form bazaars. The low portions of the island, being 12 feet below low water mark, would be destroyed without the existence of one large *vellard* or causeway, and several smaller ones: the ground floor of this town are only on a level with ordinary high tides; drainage is consequently uncertain, and the soil is always damp.

The *Bombay Times* in 1851 commenced a series of articles on the native arts, the first of which was inserted in the *BUILDER Journal*, viii, 386. The railway to Tannah, a town on the island of Salsette, commenced October 31, 1850, was the first railway begun in India. *Life in Bombay*, 8vo., London, 1852.

BON (PIERRE ETIENNE LE) was admitted a member of the Academy of Architecture in Paris in 1741, and died in 1754. He was one of the architects who submitted (1748-53) designs for the *place de Louis XV*, or du Pont-tournant at Paris.

BONACCORSI, see BUONACCORSI (PIETRO).

BONALINO (.....). When the church founded at Bamberg by queen Kunigonda (1000-1019) began to decay, it was resolved to rebuild it on a larger scale, and the new edifice, dedicated to S. Stephen, was designed by Bonalino in 1628 or 1629. He was probably the same Bonalino who was summoned from Schesslitz to Bamberg to build the Capuchin church and convent; the church was finished in 1649. JACK, *Pantheon* (v. Reider). 68.

BONAMICI, see BUONAMICI.

BONANNO PISANO, see PISA (BONANNO DA).

BONARROTI, see BUONARROTI (MICHEL AGNOLO).

BONAVENTE or BONAVENTURE (NICOLAS DE), of Paris, was engaged as architect "*ingegnere generale*" to the cathedral at Milan from 6 July 1388 till 31 July 1391. He designed the east window, executed by Campania. 27.

BONAVIA (SANTIAGO), born at Piacenza in Italy, went to Spain during the reign of Philip V (1700-46), and became on the death of Marchand in 1733 *aparejador* to the palace at Aranjuez, under Leandro Brachelieu, on whose death he became *maestro-mayor* there; he enjoyed the same post in the

cathedrals of Toledo and Seville. The churches of S. Antonio at Aranjuez, and of SS. Justo y Pastor at Madrid, were designed and superintended by him, and he also constructed the theatre of the *Buen Retiro*, which was afterwards altered by his countrymen Bonavera and Pavia. At his death, 18 September 1759, he was honorary director in the architectural section of the Royal Academy of S. Fernando, and warden (*concierger*) of the palace at Aranjuez, where after the fire in 1748 he directed the execution of the repairs and of the principal staircase, which he had designed in 1744, altered the western front by the introduction of a double loggia, and finished the palace in 1752 by completing the works of his predecessors; the wings, chapel, and theatre, were added after his death. 66.

BOND (JOHN LINNELL) was born about 1766. He obtained the gold medal of the Royal Academy in 1786; but exhibited at that institution as early as 1782; these drawings were views of mansions in London, and some designs; but in 1793 mention is made of "a perspective view of a triumphal arch to be erected in the Crimea by George Cameron, Esq., architect to the empress of Russia"; in 1796 is a view of Wimbleton villa; and also of a villa in Kent: in 1806 the anatomical theatre, museum, etc., for J. Brooks, Esq., in Blenheim-street, Oxford-street; in 1808 the front to Messrs. Tatham and Bailey's house, Nos. 13 and 14 Mount-street, Grosvenor-square; in 1809 "section of a room erecting at Southampton castle, for the marquis of Lansdowne, after the manner of the Moorish architecture of Granada"; in 1811 Exton-hall, Rutlandshire, for Mr. afterwards Sir Gerard Noel; and designs for commercial rooms at Bristol; and in 1814 a villa at Bushey, Hertfordshire. For Sir G. Noel he also executed the principal inn at Stamford, Lincolnshire. His design for the Strand, now called the Waterloo bridge, made for the projector, George Dodd, engineer, appears to have met with high approval; in the Act of Parliament for its erection, Bond is named assistant architect. His classical attainments enabled him to draw with pleasure such compositions as "the temple of Jupiter at Olympia, with the procession of the conquerors in the games", exhibited in 1803; and the "interior of the temple of Apollo at Delphi", exhibited in 1810. In 1818 he travelled into Italy and Greece, returning in 1821. He contributed to the *Literary Gazette* subjects connected with his profession; and left in manuscript a translation of Vitruvius, the work of some twenty years. He died 6 November 1837. Several of the drawings above mentioned are in the collection of the Royal Institute of British Architects. GENTLEMAN'S MAGAZINE for 1837.

BOND (It. *collegamento*; Fr. *liaison*). A general expression for the arrangement of materials used in construction with a view to prevent fissures. G. R. B.

BOND. A term used to express the mode of placing small materials, such as bricks, rubble, or small dressed stones, in walls, so that by breaking joint in every direction each separate brick, stone, tile, or flint, holds in and retains its neighbour in its place, and is itself retained in the same manner.

In brickwork the only styles of bond now generally adopted are called "ENGLISH" and "FLEMISH" bonds. In the former, A, the courses are laid alternately, all headers and all stretchers (Fr. *appareil à assises alternatives, en queue et en boutisse*); in the latter, B, the



bricks of each course are laid header and stretcher (Fr. *appareil à assises régulières, dans lesquelles les briques sont disposées alternativement en queue et en boutisse*; there are no short phrases in French to express these modes of work): of the two, old English bond is usually considered to be much the stronger. SAUNDERS, *Observations on Brick Bond as practised at various periods*, 8vo., London, 1805; and reprinted in vol. i of the CIVIL ENGINEER, etc., *Journal*, is a good work on the merits of these

bonds. A dovetailed brick for the working of 'BRITISH' bond was invented and registered in 1852 by Mr. W. Austin; in its courses it is similar to Flemish bond. Yorkshire or FLYING bond is the term used when the courses are irregular but the stretchers prevalent. A few examples will be found of work showing headers only. BRICK BOND. HERRING-BONE.

In masonry, when small or rubble stone is used, the bond or work (for the term bond can hardly be regarded as correctly applied in some of the following cases) may be either the *opus reticulatum* (It. *ammandorlata*; Fr. *appareil maillé*), in which the materials are placed so as to produce externally the effect of network; or it may be the *opus incertum* (PERRAULT suggests that it should be *insertum*), (It. *incerta*; Fr. *à appareil brisé*), in which the materials are placed so as break joint, and to form of themselves a regular bond. The Greeks, according to VITRUVIUS, xi, 8, in addition to these designations of the mode of walling, further subdivided them into the *isodomum*, in which the heights of the courses (Lat. *coria*; It. *filari*; Fr. *assises*) were equal; the *pseudisodomum*, in which they were unequal; and the *emplecton*, in which walls were executed by means of outer coatings of stones laid in courses, with a filling in of smaller materials and mortar, and occasionally tied together by means of *through* stones or bonding courses (Gr. *διόρυτοι*; Fr. *parpaings*) passing through the whole thickness of the wall; or of *binders* which do not pass through the whole thickness of the wall. The modern French masons call the style of work or bond executed with coursed rubble stone *maçonnerie en moillon smillé*, without paying much attention to the equality or the inequality of the courses; irregular rubble masonry they call *moillon brut*, or more commonly *Limousinerie*, from the Limousin masons, who are usually employed to execute such work. MASONRY; RAG WORK; RUBBLE. G. R. B.

BOND COURSE (It. *caterina*; Fr. *chaîne*; Ger. *band*). A course or horizontal layer of wood, metal, stone, or brick, introduced at intervals in a wall in such a manner as to connect the smaller materials, and to prevent the formation of vertical fissures by any unequal settlement of the materials themselves.

In the houses formerly built in London, and in the parts of England where bricks are habitually used, wood bond one or two courses in depth was generally adopted; and even at the present day it is far from being abandoned; plasterers' laths were often used in the thickness of the joint. There are, however, very serious objections to its use; it is often instrumental in communicating fire; being in contact with the external masonry, and utterly without ventilation, it is exposed to receive and communicate the germs of the dry, or of the wet, rot; and by shrinking it often causes the work above to settle, especially when the bond is flush with the face of the wall. G. R. B.

The great advantage of wood bond is in thin walls, such as are usually put to dwelling houses; it tends to keep them steady and true while being carried up, prevents them from being racked by the wind or by the scaffolding, and it is of much service in this respect; for these reasons, although liable to rot after the work is set, it is superior in thin walls to iron bond, which answers well where tension is required. It should, however, never be used in thick walls, in basement stories, or where cross walls occur at short intervals. In the course of building a house, the bond timbers pass through all apertures, and are afterwards cut out when the carcass is completed. The *principal* or *chain* bond is generally placed in one or more tiers to each story, according to its height, exclusive of the wall plates to the joists and roof. *Common* bond, generally 4 inches by 2½ inches, is placed for the purpose of securing the interior finishings. PLUGGING, WOOD-BRICKS. H. B. G.

Latterly the London builders have introduced a system of bond courses executed in brickwork bedded in cement, occasionally placing in the beds tiers of HOOP IRON; a system which, in addition to its immunity from the objections against wood bond, has the advantage of allowing the "bond" to be carried through the whole thickness of the wall.

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In some cases, also, BOND STONES or bonding courses of dressed stone are used, the ends being dowelled or cramped together; the ancient Romans employed for this purpose their peculiar brick, a thick flat tile, about 2 feet long by 1 foot 6 ins. wide, inserted at intervals of about 4 feet in height.

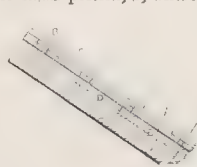
The value of hoop iron and cement bond courses depends greatly upon the adhesion of the cement; and when the latter is of superior quality and *properly used*, it is doubtful whether the hoop iron serves any useful purpose. Indeed, if that material be not either coated with hot tar and sand before being built into the wall, or be previously allowed to rust, it is hardly possible that the smooth surfaces of the crystals of the cement should adhere to the still smoother rolled surfaces of the hoop iron. The opinion of the majority of practical builders appears to be in favour of the use of the tarred and sanded iron bond; but upon a *good foundation* it is questionable whether it would not be preferable to dispense with that rather expensive material. G. R. B.

The most perfect combination of iron hooping with cement is obtained when the iron has been allowed to rust before it is used. The hooping should always be turned up or down at the end of each length. The value of cement bond, however, depends on no settlement taking place in the foundations, because its very rigidity fails immediately upon being exposed to a cross strain. H. B. G.

These courses worked in cement are an useful bond, but their utility is very greatly increased by the introduction of the iron hooping above referred to. As its effectiveness as a bond is wholly due to the adherence of the iron to the cement, it is found advantageous to tar and sand over the surface of the iron to make it bite the cement, and such is the general practice of all good builders. When these bonding courses are carefully executed with good materials, and the ends of the hooping securely lapped together so as to prevent any longitudinal extension, it is surprising what enormous weights brickwork so executed will carry over an opening, without any arch or lintel. It is believed that the first application of iron hooping to this purpose was by the late Mr. Brunel, in the execution of the circular shafts leading down to the Thames Tunnel, which were built above ground as brick cylinders, and gradually lowered down into their present places without any rent or damage whatever, owing to the effective nature of this bond. Sir Robert Smirke was the first to apply this mode of construction to the ordinary purposes of architecture. When the foundation is firm and good there is probably no occasion for this precaution, but when there are doubtful parts in the foundation, and especially when there are many openings in the wall to be built, there is no bond so serviceable; and when the wall is high and the openings in it irregular and numerous, the bonding courses should be introduced at frequent intervals during the progress upwards of the work. S. S.

IRON CHAINS, iron bars (It. *stringhe*; Fr. *liens*), and iron hoops, have been used in buildings as BONDS, BANDAGES, and TIES, from an early period. G. R. B.

BOND IN SLATING, also called 'lap', is the term given to the small portion, B, where a treble thickness of slate exists.



Bond and also 'gauge' have been applied to the distance, A, from the nail of a slate to the lower end or drip of the one above it. The space, C, between the drips of the slates is the 'gauge, bare, or margin'; the space, D, between the heads of

the slates as seen from below has also been termed the 'margin'; the part, E, concealed from view is termed the 'cover'.

BONDE (MARQUIS DE), a Swede, while in France at the end of the seventeenth century, drew and engraved plans, elevations, and sections of a château, which are included by MAROT in one of his *Recueils*. J.

F. F.

BONDONE (AMBROGIO), written by himself in Latin *JOCTUS* and *JOTTUS*; commonly called (Ambro) *GIOTTO*, was born at Vespignano near Florence, about the year 1266, according to most authors, but 1276 of *VASARI*, and became one of the first Florentine painters; he was also a sculptor. By a decree of the government of Florence, dated 12 April 1334, he was made director of all the public works of architecture in the state, but only one work is positively ascribed to him as an architect. He designed for the church of Sta. Maria del Fiore the celebrated campanile (*Illustrations*, pl. xxv), which was begun 9 July 1334, and was finished by his pupil Taddeo Gaddi, after the death of Giotto, which occurred 8 January 1336. 30.

BONE ASH. This ash appears to have formed an important ingredient in the water cement or stucco "for building incrustation or stuccoing, and artificial stone", patented in 1779 by Bry Higgins, M.D. The manufacture and use are detailed in chap. xxii of his work, entitled *Experiments, etc., of Calcareous Cements, and of Preparing Quick Lime*, etc., 8vo., London, 1780.

BONE, or to **BONE** (Fr. *bornoyer*), see **BONING**.

BONE BLACK. An animal charcoal used as a pigment.

BONE-HOUSE (Fr. *ossuaire*). The building to which this term properly belongs is so rarely seen in England, that the word has been for many years improperly used (indiscriminately with the term *charnel* or *charnel-house*) for the vault or crypt under churches built in the seventeenth and eighteenth centuries, although it is rarely applied to more ancient crypts. In some English churchyards, till within the last twenty years, the bones turned up by grave-diggers have been put into a small room in the churchyard, the walls of this bone-house being composed in part of the decayed tomb-stones. The practice has obtained for some centuries on the continent; the catacombs of Paris being perhaps the largest example of a bone-house: while *NODIER* and *TAYLOR*, *Voyage Pittoresque*, fol., Paris, 1845 (Bretagne), vol. ii, illustrate buildings of the Pointed and Renaissance periods at Landivisiau, S. Pol-de-Léon, Faouët, Pleyben, and Lanleff. Every Parsee tomb in India is *CHARNEL* and bone-house combined in one tower.

BONENSACK. This word being inscribed under a figure serving as a corbel in the cathedral church at Magdeburg, commenced in 1208, tradition assigns to them the name and portrait of the designer of that edifice. 92.

BONIFACIO (MARTIN SANCHEZ) was *maestro-mayor* to the cathedral at Toledo from 1481 to 1494. In 1484 he executed the portal of the old *sagrario*. 66.

BONILLA (MELCHOR DE) was appointed 13 October 1532 *aparejador* to the cathedral at Seville, under Diego de Riaño, after whose death he took the whole superintendence of the works. 66.

BONING. The act of trying the correctness of an angle, an aris, an edge, or a plane surface, by the eye or by a straight edge. The term is also used for the act of protracting a line in surveying. 2.

BONINO PISANO, see **CAMPIONE** and **PISA** (BONANNO DI).

BONN. A city in the province of the Rhine in Prussia. The *münster*, dedicated to S. Cassius, is of various dates. Part of the choir and the crypt is Byzantine; the east end of crypt, the semicircular apse of the choir, and two eastern towers with low spires, belong to the middle of the twelfth century; and the remainder, inclusive of the pointed vaulting of the choir, the two western round turrets with tall spires; the central octangular spired lantern, the transepts ending in five-sided apses, and the nave with clerestory, flying buttresses, and aisles, are assigned to the commencement of the thirteenth century. It has also a pretty Romanesque cloister of two stories in height. A good view is given by *GAILHARBAUD*, *Monuments*, ii, 85, copied from *BOISSERÉ*, *Monuments, etc., du Rhin*, fol., Munich, 1842, pl. 56, who also, in pl. 1, illustrates the round church of S. Martin, one of the seven other churches and chapels in the city; the churches of S. Remi and of S. Pierre deserve notice. The

modern town hall is the handsomest structure of thirty-six public buildings. The university, founded in 1818, occupies the former palace of the electors of Cologne, commenced in 1717, which also contains the hospitals; its collection of objects in natural history is at Poppelsdorf, another château half a mile distant, which is connected with it by an avenue of chestnut trees. Near Bonn is the Kreuzberg, a hill on which a Servite or Minorite convent formerly stood: the church of the Holy Stairs, as it is called, which was built in 1627, still remains. The *scala santa*, an imitation of that at Rome, was constructed of Italian marbles in 1725. A charnel-house or crypt exhibits several well preserved bodies in open coffins. The *ILLUSTRATED LONDON NEWS* for 1845, vii, 101, 116, gives the Beethoven statue by Haechnel. W. H.

BONNARD (JACQUES CHARLES), born at Paris 30 Jan. 1765, was a pupil of Renard, obtained the *grand prix* of the Académie des Beaux Arts, and devoted his studies at Rome to the restoration of the six great antique aqueducts which are disused. In 1789 Renard was directed to make the Tuileries habitable as a palace for Louis XVI, and invited Bonnard to return home as his assistant. Under the first Revolutionary troubles Bonnard went to England; but soon revisiting Paris, he was employed as a draughtsman and engraver for a work upon the palazzi of Italy. Renard had designed the *palais du ministère des relations extérieures* on the quai d'Orsay, but died in 1807, just as the building was to be commenced; Bonnard having succeeded as architect to the department, his own design was adopted after much consultation. Funds at the expiration of five years being deficient, its completion was not undertaken until 1830, when it was entrusted to his pupil Lacornée. Bonnard was subsequently named *inspecteur des bâtimens des droits réunis*, several of which he completed with great economy. He was appointed by an ordonnance royale in 1816 a member of the Académie des Beaux Arts, and died in 1818 at Bordeaux, where he had been sent by the government to direct several works. *QUATRE-MÈRE DE QUINCY*, *Eloge* in the *Mémoires de l'Institut*. 84.

BONNEVIE (ÉLOI-JOSEPH), born in 1783 at Mont Louis near Paris, was a pupil of P. J. Delespine, as being *inspecteur des travaux du Gouvernement*, he was one of the two architects of the great theatre at Brussels, in which city he built in 1810 the large prisons and the great riding school. He afterwards at Paris erected the convent of the *Scurs de Charité* in the rue du Bac; the tomb to the architect Damesme in Père la Chaise; several dwellings in the chaussée d'Antin; and the orangery and hothouses for the duchess de Raguse. Various designs by him are recorded by *GABET*, *Diet.*, 8vo., Paris, 1831.

BONNUEILL, or **BONNEVILL** (ESTIENNE DE), also called Pierre de Bonneveil (the name is written ESTIENNE BONNEIL in *ARTAUD*, *Italie*, 8vo., Paris, 1835, p. 83, and in the *Revue Générale de l'Architecture*, i, 196), acknowledged in 1287 before the *garde de la prévosté* of Paris the receipt of forty livres paid him to travel to Sweden with ten partners, "*compagnons*", and as many pupils, "*bachelers*", in order to build the cathedral of the Holy Trinity at Upsala. The documentary evidence of this curious fact, and a view of the church are given by *PÉRINGSKJELD*, *Monumenta*, fol., Stockholm, 1719, p. 18.

BONO or **BONUS**, see **BUONO**.

BONOCORE, see **BUONOCORE** (....).

BONOMI (JOSEPH), born in Rome 19 January 1739, was educated in the collegio Romano, and became the pupil of the Marchese Teodoli. He went to England in 1767, on an invitation from the brothers R. and J. Adam, with whom he remained several years. His perfect knowledge of perspective conducted to his subsequent success. During his visit to Italy in 1784, he received the diploma of associate of the Clementine Academy at Bologna. In 1776 he made a design for the sacristy which pope Pius VI proposed to erect at S. Peter's at Rome. He was elected associate of the Royal Academy of Arts in London, 12 November 1789. In 1804 he received from the congregation

of cardinals entrusted with the care of S. Peter's at Rome, an honorary diploma constituting him architect to that fabric. He died 9 March 1808, and was buried in the Marylebone cemetery, on the north side of Paddington-street; the epitaph is recorded by LYSONS, *Supplement to Environs of London*, 4to., London, 1811, p. 227. Of his surviving sons, the elder, Ignatius, practised till lately as an architect at Durham; and the younger, Joseph, was for many years engaged in Egypt in studying the ancient monuments of that country.

Amongst his executed works and designs, chiefly in the Grecian style, were, 1784-8, Dale Park, Sussex, for John Smith, Esq., M.P., NEALE, *Seats*, etc., v, ser. 2; 1786, the library at Lansdowne House, Berkeley-square, the present one, however, was executed by G. Dance, jun.; 1789, the gallery at Townley Hall, Lancashire, for the collection now in the British Museum; designs for the restoration and completion of Sutton Place, Surrey; 1790, a gallery and a small church at Packington, Warwickshire, for the earl of Aylesford, NEALE, *Seats*, etc., iv, this church is solidly vaulted throughout, timber not being used; a saloon for Mrs. Montagu, Portman-square, London; considerable additions to Langley Hall, Kent, for Sir Peter Burrell, Bart.; 1792, the chapel in Spanish-place, Manchester-square, London; the south front of Uxbridge House, Burlington-gardens, London, arranged for John Vardy, architect, BRITTON, *Public Edifices*, 8vo., London, 1825, i, 82; 1793-9, Eastwell House, Kent, a mansion of considerable extent, for George Finch Hatton, Esq.; 1794, a pyramidal mausoleum in Blickling Park, Norfolk, to the memory of John second earl of Buckingham; 1795, a house for R. Knight, Esq., in Warwickshire; 1794-7, Longford Hall, Shropshire, for R. Leake, Esq., exhibiting perhaps the earliest adaptation of a portico projecting sufficiently to admit carriages; 1798-1802, offices and additions to Lambton Hall, Durham, for the earl of Durham, uniting the old east and west ends; this mansion was enlarged and completed by Bonomi's son; the edifice of late years has suffered much damage from the coal works beneath it; 1797, a mansion at Laverstoke near Whitchurch, Hampshire, for Henry Portal, Esq.; also one at Sandling near Hythe, Kent, for W. Deedes, Esq.; at Piercefield near Chepstow, Monmouthshire, for Sir Mark Wood, Bart., a saloon and an elegant winding staircase, ACKERMANN, *Repository*, v, ser. 3, 1825, p. 313; and lastly, 1803-6, an Italian villa at Rosemeath, Dumbartonshire, for the duke of Argyll, which still remains incomplete. It is Bonomi's most celebrated work. NEALE, *Seats*, etc., vi, gives a perspective view; the plan is in the treatise on *Civil Architecture* (by Telford) in BREWSTER'S *Edinburgh Encyclopedia*, pl. 181. The front of the entrance portico is remarkable for a column being placed in the centre, the better to express that the portico is intended for the protection of carriages; there being no pediment, a support is obtained for any appropriate sculpture.

These works have been considered to have contributed to the diffusion of taste in the erection and embellishment of private mansions; indeed the name of Bonomi occurs in the best novels of his period as the architect consulted on all occasions in matters concerning a country residence.

BONONIA. The Latin name of BOLOGNA.

BONSIGNORE, see BUONSIGNORE (FERDINANDO).

BONTALENTI, see BUONTALENTI (BERNARDO).

BONTEMPI, see BUONTEMPI (MICHELE).

BOODROOM or BOUDROUM, in Karamania, the modern name of IALICARNASSUS.

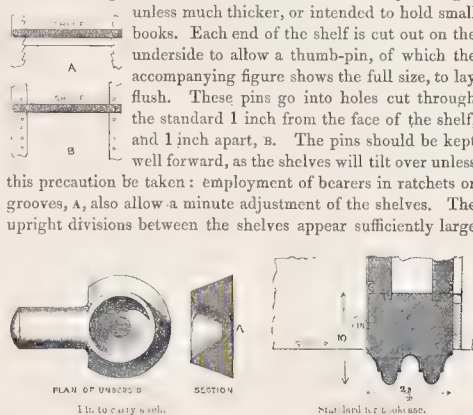
BOOKCASE (It. *scansia*; Sp. *armario*; Fr. *armoire*; Ger. *bücherschrank*). A cabinet with one or more shelves to contain books. A description of an ancient bookcase is given s. v. BIBLIOTHECA. Bookcases of the Medieval and Renaissance periods have been illustrated by SOMMERARD, *Les Arts du Moyen Age*, fol., Paris, 1846. The bookcases designed by Michel Agnolo Buonarroti for the Medicean library at Florence, are given in the *Illustrations*, FURNITURE, pl. xxxiv.

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Modern bookcases are generally little more than shelves supported between upright divisions called standards, with or without doors. In the country these may sometimes be dispensed with, but in towns they assist much in keeping out dust; they should be glazed, and so hung as to fold flat back, and with the framing should be so arranged that no impediment occur when drawing out any books without disturbing the adjoining volumes. A bookcase is usually divided into two portions. The lower part should not be less than 1 foot 10 inches or 2 feet deep and 2 feet high in the clear, for the largest sized books, and should have a table top and drawer. The upper part should be 1 foot deep in the clear, for smaller books.

H. B. G.

Each shelf or bookboard (It. *scaffale*; Sp. *arraquel*; Fr. *tablette*; Ger. *bücherbrett*) should not exceed 30 ins. in length if an inch and a quarter in thickness, and it should rarely be longer unless much thicker, or intended to hold small books. Each end of the shelf is cut out on the underside to allow a thumb-pin, of which the accompanying figure shows the full size, to lay flush. These pins go into holes cut through the standard 1 inch from the face of the shelf, and 1 inch apart, B. The pins should be kept well forward, as the shelves will tilt over unless this precaution be taken: employment of bearers in ratchets or grooves, A, also allow a minute adjustment of the shelves. The upright divisions between the shelves appear sufficiently large



when $1\frac{1}{2}$ inches thick; at the British Museum, where they assist in carrying a gallery, each alternate standard is $2\frac{3}{4}$ inches thick as shewn; these divisions need not be more than 3 inches deep from back to front, including the bead upon the face. The usual calculation for an extensive library is that forty-six volumes on an average occupy four square feet of upright space. The depth of the lower portion of a bookcase having doors regulates the depth of every shelf upwards; but a handsome effect is obtained when each shelf is allowed to recede from the front. Otherwise false backs will be necessary.

BOONDEE. The capital of the principality of the same name in Rajasthan in Northern India. It now consists of two portions, called the old and the new town. Old Boondce contains some large pagodas, but is nearly in ruins, the population preferring to occupy only the eastern corner of it. The houses of New Boondce, which are generally two stories in height and built of stone, are enclosed by a high stone wall communicating with the fortress-palace, which stands on a precipitous rock 400 feet above the surrounding plain. From the palace there is a street of shops, almost unparalleled for picturesque architectural effect, as shown by FERGUSON, *Pictorial Illustrations*, fol., London, 1847, pl. 16. This terminates at a large temple dedicated to Krishna, and covered with sculpture, which is accompanied by the figures of an elephant and a horse, both larger than life, and placed on pedestals. FERGUSON, pl. 17, also gives a view of a remarkable *bouree* or well. Both towns are said to possess magnificent fountains, supplied from a reservoir or artificial lake in the high ground to the north-east of the city. The pass through the hills north of Boondce is six miles in length, and defended at three points; near one of these spots is the summer palace and some Hindoo temples, and at the middle one is the royal cemetery, containing some highly decorated tombs with figures of horses and elephants.

W. R.

BOONEN (LIEVIN), with Jean Collins, renewed in 1429 nearly the whole of the church of S. Nicholas at Ghent. 97.

BOORHANPORE (the native *Barhanpura*). The former capital of the province of Candeish in Southern India. It ranks among the largest and best built cities in the Deccan, being one of the few in India laid out in wide and regular streets. The houses, which are frequently three stories in height, have neat fronts framed of wood, and their roofs covered with tiles. The town, situated on the river Tuptee, is well supplied with water by an aqueduct four miles in length, which supplies a canal in nearly every street under an excellent pavement, whence the water is drawn by a rope and bucket through apertures like wells; the baths and fountains are supplied from cisterns, the water being raised by pumps. Little architectural interest is attached to the public buildings, such as the remains of the fortress and palaces, or the mosques and tombs, except that the *jumma masjid* or great mosque, which is built of a grey stone on a grand terrace with a large tank or reservoir, has no dome, although it has a long façade composed of a range of low arches between two octagonal minarets, each 100 feet in height; a dome being the distinctive feature of a mosque in almost every other part of India. This mosque also has a fine fountain.

W. H.

BOOROOT. The native name for the English satin wood, or *SWietenia chloroxylon*.

71.

BOOTH (Ger. *bude*). The original meaning of this word was a temporary building of boards to contain the spectators at plays and similar exhibitions: the term is still applied to such erections as **POLLING BOOTHS**; and has been inappropriately given to tents and awnings, such as cover stalls at fairs.

1. 2. 4.

BOPPART (the Latin **BAUDOBIRGA**). A town in the province of the Rhine in Prussia. The walls of a fort built by the Romans still exist in the centre of the town, but the outer walls are mediæval. Wooden houses, in narrow, dark, and ill-paved streets, form a series of picturesque views. The *Hauptkirche* or cathedral, built about 1200, is celebrated for its wooden bridge connecting the two eastern towers. "The aisles have large subvaulted triforium galleries, which have eastern altars in them and open seats; but their level is three steps lower than the plinth of the triforium arches, as if they had rather been intended as chapels"; WEBB, *Sketches*, etc., 8vo., London, 1848. HOPKINS, *Historical Essay*, 8vo., London, 1840, p. 296, states that the cathedral is also remarkable for the various shapes of the arches, in its front, sides, and semi-octangular absis; some being pointed, but evidently of the same age as the round-headed ones; and for the small gallery under the roof of the absis. The Carmelite church has a nave and chancel, a north aisle to the nave, and a chapel on the north side of the chancel, and it contains much good carving to the double stalls, etc.; this and the *Bayer-haus* are both described by WEBB. The *Tempel-hof* or Templars' house is curious. In the environs is the convent of Marienberg, built in 1738.

28.

BORACIC ACID, also called Sassoline when native, occurs in Italy. It is an oxide of boron, containing 10.9 parts of boron to 24 parts of oxygen, and is now chiefly supplied from works at Monte Cerboli, near Volterra in Tuscany, described in the *CIVIL ENGINEER Journal*, viii, 299: it is in high repute as a flux, especially for glass, although it is very expensive, and so extremely powerful that unless applied with great caution it corrodes the pots, introduces alumine into the fused metal, or passes away through the pores of the vessel.

71.

BORASSUS FLABELLIFORMIS or Palmyra wood (*thattu kuma; tar; panamkuttu* of Cuddnapah, East Indies), is said by LAIRD to be largely imported into Madras and Pondicherry, from the Jaffna district at the northern part of Ceylon, for the construction of flat roofs; the joists of which consist of two slabs, the third or fourth part of the tree, bolted together by their flat sides so as to constitute elliptical rafters. They are covered first with flat tiles, and then with the cement or concrete called **CHUNAM**. HOLTZAPFFEL, *Woods*, 8vo., Lond., 1843.

BORATE OF LIME, also called Hayessine when native,

as found in the same locality as nitrate of soda, near the port of Iquique, in the province of Tarapaca in Peru. It contains about 45 per cent. of boracic acid, 35 of water, and 20 of lime; the moderate price, white colour, and absence of any other metallic oxide, render it an excellent flux.

71.

BORAX. The pure bichlorate of soda. It is a product of Thibet, and imported from India in an impure state called *chrysocolle*, *lincal*, and *pounna*, and is also made by combining soda with **BORACIC ACID**. Borax is decomposed by hydrochloric, nitric, and sulphuric acid, and by most of the vegetable acids; as it fuses at a red heat into a transparent glaze, it is used for porcelain and the better kinds of earthenware; in solution it dissolves several of the resins; and some of the resultant mixtures, especially that with lac, form good vehicles for colouring matters: it also serves as flux under the blowpipe. It has been applied alone, or with phosphate of ammonia or soda, to render articles of dress, paper, wood, etc., incombustible to some extent, as it covers them with a vitrifiable glaze, which prevents the access of air. For this reason it is useful in soldering, as when the surfaces which are to be joined are cleaned, and the solder with borax applied and heated until the joint is made perfect, the borax not only prevents oxidation of the metal surfaces under the solder, but obviates any oxidation that may have accidentally occurred after the cleaning. It has also been used in the manufacture of a quick setting cement; Keating's, now Parian, cement was at first made of sulphate of lime 87.2, sand 2.0, water 9.6, and borax 1.2, and is now dehydrized gypsum saturated in a solution of this salt.

W. H. 104.

BORBETOMAGUS. The Latin name for Worms in Germany.

BORDEAUX or **BOURDEAUX** (the Greek **BOURDIGALA**, and the Latin **BURDIGALA**). The capital of the department of the Gironde in France, and the seat of an archbishopric. The only Roman architectural remains are those of two aqueducts; and of the *palais Galien* or palace of Gallienus, a name given to an amphitheatre nearly destroyed in 1792; it was 252½ feet long by 180½ feet wide internally, with six ranges of seats, and 442 feet 8 inches long by 370 feet wide externally, and had two stories of arcades; it is described by DE CAUMONT, *Cours*, 8vo., Paris, 1838, iii, 474. The *Tuileries* or *palais tuilè*, which was near the great theatre, is engraved in PERRAULT's *VITRUVIUS*, fol., Paris, 1684, p. 219, and in STUART and REVETT, *Antiquities of Athens*, fol., London, 1827, iii, 120: it deserves mention as one of a rare class of ancient monuments. VENUTI, *Dissertation sur les Anciens Monuments*, 4to., Bordeaux, 1754.

Bordeaux consists of an old and a new town, divided by the *rue du Chapeau Rouge*, which commences near the river at the exchange, and runs westward across the city, being continued by the *rue de l'Intendance*. Immediately southward of these for their whole length was the Latin town; and still further behind them is the Mediæval Bordeaux, which is composed of irregular *places*, with narrow, crooked, and insignificant streets.

The only old houses of importance are to be sought in the *rues des Balentiers* and *du Mirail*, as well as round the fossés, or boulevards as they are elsewhere called, and in the *place du Palais*: the *place S. Projet* has a curious cross and iron enclosure.

The left bank of the river Garonne forms a curve confined for nearly three miles by buildings in a French-Italian style, including the quai des Chartres, the exchange, the custom house, the ropery, and the dockyards, which have been considered to form the handsomest crescent of that extent existing: more than three hundred of the houses facing the river were built in three years, between 1743 and 1746, and are of uniform design. The bridge was commenced in 1811 and finished in 1821, by a company of shareholders, at a cost of £260,000, many difficulties having been overcome in the construction: it is 1596 feet 9 inches in length between the abutments, and 48 feet 9 inches in width between the parapets, and consists of seventeen arches of stone, the seven central ones each 87 feet in span; the walls

and spandrels are of brick with stone quoins; vaulted passages are constructed under the roadway, to facilitate repairs when needed.

Both portions are built of a light stone very easily worked. The new town is laid out with great regularity: the streets and places are handsome, and the *faubourgs* (especially that of the Chartrons, which has been called the finest suburb in Europe) are composed of edifices displaying great taste and wealth; the upper portions of the dwellings exhibit much decoration, while the lower parts are chiefly occupied by mean shops. The city is divided by the river from one of the suburbs, *la Bastide*; and from the other four, which are nearly equal in size to the town itself, by roads called *cours*, answering to the *boulevards* of Paris. The north and south sides of the place which occupies the site of the *château Trompette* are planted with avenues of trees, and the west side is bounded by a handsome crescent of houses, while the east side, open to the river, is decorated with two rostral columns 6 feet 6 inches in diameter and 65 feet 6 inches high, erected as beacons in 1829 from the design of Poitevin: the place is about a quarter of a mile square, and contains two fine public baths designed by Lacleste in 1826. There are only eight gates remaining; viz. the porte de S. Eliège, dating probably from 1246; du Caillau or du palais (de l'Ombrière), built in 1492; Neuve or des Capucins, 1744; Dijaux, 1747; Bourgogne, designed by Chevalier or Chevê in 1750; de la Monnaie, 1752; d'Aquitaine, 1753; and de Toscanam, 1756.

The Carthusian church of S. Severin or Seurin, which has a fine south porch dating about 1267, was formerly the cathedral, and still possesses a stone episcopal throne: the Romanesque cloister is given by LABORDE, *Monuments*, fol., Paris, 1836, pl. 121: the edifice was restored 1822-29. The cathedral, dedicated to S. André, is altogether about 113 feet in length; the nave, which has no aisles, is 197 feet 9 inches long, 55 feet 9 inches wide, and 88 feet 6 inches high; the transepts are 137 feet 9 inches long, 36 feet wide, and 108 feet 3 inches high; the choir is 108 feet 3 inches long, 42 feet 6 inches wide, and 108 feet 3 inches high; with aisles 23 feet wide, 33 feet high, and chapels 47 feet long, 29 feet 6 inches wide, and 33 feet high: the façade has two towers with spires, altogether 150 feet in height, which were repaired in 1810. It is described by BOURASSÉ, *Cathédrales de la France*, 8vo., Tours, 1843, as having seven bays in the nave belonging to the style *Romano-Byzantin* of the early part of the twelfth century, with the windows over them in the style *ogival primaire*, the eastern portion being of the style *ogival secondaire*, and several vaults of the nave of the style *ogival tertiaire*. English artists, according to local tradition, have the credit of designing the choir and the spiral turrets (restored in 1810) of the north transept, which has also a fine portal and a rose window: its vaulting was destroyed in 1820, by the fall of the gable during a great storm, but the whole building was restored in 1834; *Moyen Age Pittoresque*, pl. 169; *Moyen Age Monumentale*, pl. 134. Near the east end is the tour de Peyberland or de Pierre Berland, formerly 262 feet in height, commenced in 1440 by the bishop of that name (1430-56): the spire, which was 100 feet in height, was taken down in 1793; and the tower, which is square at bottom but circular at the top, ascended by two hundred steps, has since been used as a shot tower. The church of Ste. Croix is an entirely Romanesque edifice: that of S. Michael, built by the English (before 1453), is 242 feet 9 inches long, and 75 feet 9 inches wide; the nave and choir belong to the thirteenth century, and the north front to the fifteenth; the east end has a clerestory and triforium like the nave, the apse being only a shallow projection from the great arches; the church also contains a fine organ, pulpit, and chapel of S. Joseph (*Renaissance*), and some good glass. At the west end is a detached hexagonal belfry tower 39 feet 4 inches in diameter, with angle buttresses 6 feet 6 inches wide, projecting 8 feet 6 inches; these were 196 feet 9 inches high finished with pinnacles, and the tower

141 feet high to its parapet; this was commenced by Lebas or Lobas in 1472, and finished by his son in 1492: the dodecagonal spire was raised to the height of 161 feet more by two masons, as their companions refused to undertake the dangerous task; it was destroyed during a storm in 1768: beneath this tower is a charnel vault. The churches of S. Pierre and S. Eloi were restored in 1823; that of S. Bruno, consecrated by cardinal De Sourdis (1598-1628), is 134 feet 6 inches long by 42 feet 6 inches wide and 46 feet high; that of S. Louis was built in 1671; that of S. Paul in 1676 by the Jesuits; that of S. Dominique in 1701, and was restored in 1834; those of S. Martial and of S. Nicolas are modern. There are also nine chapels for the Roman Catholic service; an Anglican Protestant church, built in 1843; two Calvinist churches, one of which, opened in 1835, having four Ionic columns in front, was designed by Corcelle, who was also the architect of the synagogue, opened in 1812, which served as the model for that at Paris. There are eleven conventual establishments still in existence.

The stranger in Bordeaux will find difficulty in understanding the different appellations given to the public buildings. The following indications may assist him in studying the architectural history of the town, which is not intelligible without several editions of its plans. The old archiepiscopal palace was commenced from the designs of Etienne, at whose death in 1774 the work was given to Lacleste; it afterwards became the *hôtel du département* (1790), *de la préfecture* (1799), the *palais impérial* (1801), the *château royal* (1814), and it has been the *mairie* and *hôtel de ville* since 1836: the new archiepiscopal residence has been in the *rue de Cheverus* since 1828, but the prelates had previously occupied the *doymé* or deanery, a work of the fifteenth century, opposite the north-west angle of the cathedral. The site of the old *hôtel de ville* is occupied by the *grand marché*, opened in 1801; north of this is the *palais de justice*, designed by Bonfin the younger; and to the south is a barrack, used as the *hôtel de ville* from 1808 till 1836. The archives of the department are deposited in the suppressed convent of Notre Dame in the *rue Ste. Thérèse*; the *hôtel de la préfecture* and the *banque* in the *rue Esprit des Lois* were designed by Louis, who also built the great theatre near them, and the *maison Fonfrede* in the *place Richelieu*. The new *bourse* or exchange, and the *douane* or custom house, both built about 1749, form two sides of the *place Royale* designed by Gabriel, and face the river; the exchange, which also contains large auction rooms and the chamber of commerce, is a rectangular building with an arcade occupied by counting houses round a central court 98 feet long by 65 feet wide, which was originally uncovered. Opinions are divided as to the architectural effect of the present semicircular and glazed roof, which forms it into a room altogether 78 feet high. The *entrepôt réel de commerce*, built in the *place Lainé* in 1824, is not remarkable externally, but is highly praised for its internal grandeur and beauty. The *magasin de viers de la marine*, designed by Bergerac 1785-1788, consisting of four large quadrangles, each one story in height, is situated near the church of S. Dominique, and is commended. The *hôtel de l'intendance*, built 1755 in the *rue du Jardin*, is now private property; the old *mairie*, in the *rue des Ayres*, was sold to the Jesuits in 1662, and the offices were transferred to the *hôtel de Normand*, which afterwards became the *hôtel du gouverneur de la province*. The old *hôtel de la monnaie* is now an Ursuline convent; the mint occupies a building formerly called the *grand séminaire*, in the north-west portion of the town; the *seminaire* was removed to a Capuchin monastery in the *rue Française*, in the south-east corner of the city, near the old mint. The building, not far from it, originally erected in 1810 from the design of Combes for the *dépôt de la mendicité* (which is removed to the north-west extremity of the suburbs), is now the *petit séminaire*: the *collège royal* occupies the former monastery of the Feuillants and the convent of Visitandines, on opposite sides of the *rue S. Antoine*. The *école des mousses* or

naval school is held in the church of S. Siméon, which is fitted up as a ship; the royal school of navigation is held in the *hôtel de la marine* in the *place de Tourny*. The riding school was built in 1754. The *amphithéâtre de S. Côme* or anatomical theatre, designed by the surgeon Massé, has been used since 1830 as an *école secondaire de médecine*. There are seventeen other educational institutions, besides the *Académie Royale des Sciences et des Arts*; the school of design, the observatory, and the public library and museums, are in the same building; the public picture gallery is in the *château royal*. The *théâtre François* or *des Variétés* was designed about 1819 by Dufart, in the *rue du Mirail*. The celebrated theatre, capable of containing 4,000 persons, was opened in 1780; it was designed by Louis, who published a description under the title *Salle de Spectacle de Bordeaux*, fol., Paris, 1782; it is supposed to be the best in existence expressly constructed in modern times for the conveyance of sound. The roof is given by CRESY, *Encyc.*, 8vo., London, 1847, p. 1325. There are five other small establishments for public amusement, including the *cirque François* designed by Durand in 1836, and the *salle Franklin*, opened in 1845, and holding 1,500 persons, which was designed by J. Burguet. The same architect designed the great hospital of S. André, which is 470 feet long by 404 feet deep, and contains 710 public and 18 private beds; it was opened in 1829, and is considered to be the handsomest provincial civil infirmary in France: the old hospital since 1837 has been used as a barrack and a prison under the municipal police. The foundling hospital, with 700 inmates; the school for deaf and dumb pupils; the lunatic asylum, rebuilt by the younger Bonfin in 1803; the military hospital, a building designed by Durand for the baths and washhouses of the parish of S. Nicolas; three other hospitals; as many almshouses; and a house of correction, deserve to be mentioned. A prison, situated between the *hôtel de ville* and hospital, was opened in 1843; it has 170 cells, the sexes being separated, and an altar placed in the "rond point" of each gallery, so that Divine Service is performed in the presence of the prisoners without their quitting the cells. It is desirable to mention the architectural character of several large private establishments, such as the Ertin sugar refinery; the abattoir designed by Durand, which is situated between the foundling hospital and the church and hospital of Ste. Croix on the one hand, and the lunatic asylum and *petit séminaire* on the other; the *galerie Bordelaise*, designed in 1834 by Durand; the *bazar Bordelais*, designed in 1835 by the younger Thiac; and the very large wine cellars, popularly called *les chais*, in several localities. The town owes its architectural reputation to an amateur, Louis Urbain Aubert, baron de Tourny, who as Intendant of Bordeaux from 1743 to 1758, procured the assistance of the best architects of the period.

Album du Voyageur à Bordeaux, 8vo., 1832; *Nouveau Conducteur de l'Etranger*, 12mo., Bordeaux, 1843; LACOLONIE, *Histoire Curieuse*, 12mo., Brussels, 1769; and DE VIENNE, *Histoire*, 4to., Bordeaux, 1771; with their continuation by BERNADAU, *Histoire*, 8vo., Bordeaux, 1837. BERNADAU, *Vie-graphie*, 8vo., Bordeaux, 1844; *Traité*, 12mo., 1810; *Annales*, 4to., 1803; and *Antiquités*, 8vo., 1797.

BORDEAUX (FRÈRE JEAN DE), a Dominican monk, built between the years 1701 and 1707 the church, now called *église de Notre Dame* (restored in 1834), and the accompanying monastery of S. Dominique, at Bordeaux.

BORDER (Fr. *bande*). The plain or ornamental face forming the decorative or structural enclosure of a piece of work, as an opening, a panel, an inlaid floor, or a ceiling: thus the plain, molded, or banded brickwork, flush with the piers, round a window or doorway, and the slips of wood which are fixed or framed together round the front slab of the hearth of a fireplace, are termed borders; and these are the most technical uses of the word in building: in timber or wooden framing, such as doors and partitions, these borders are called STYLES and RAILS. A floor is said to be *whole bordered to slabs*

when the whole of the three outer sides of the slabs are inclosed with three slips; but *half bordered to slabs* when the slips are only placed against the butt ends of the floor boards.

In gardens the word is applied to the long beds placed against a wall or along a walk, although it is sometimes used instead of the term *edging*, which applies to a border of plants, stone, tile, or metal-work, to such beds; a border of grass being technically a *verge*. 1.

BORGA. A seaport city in the district of Nyland in Finnish Russia, and the seat of a bishopric. It contains crooked streets full of miserable houses, a cathedral built of stone, a church built of wood, a public library, and a *gymnasium*. 50.

BORGHESE (FRA), born in Florence about 1252, was the son of an architect called Ugolino. In 1272 he became a lay brother of the Dominican order in the monastery of Sta. Maria Novella at Florence, in which Fra Sisto and Fra Ristoro were collecting materials for the new church, of which they laid the first stone in 1279; on their departure for Rome in 1280, perhaps no better substitute could be found than Fra Borghese, who with Fra Albertino Mazzanti directed the works for many years from 1284; and probably built the eastern side. Fra Borghese died 20 February 1313. 87.

BORGOGNONE (IL), see FOSSANO (AMBROGIO).

BORGONA (FELIPE DE), see VIGARNY (FELIPE).

BORGONZI (GIACOMO) designed the interior of the church of San Paolo della Regola at Rome. 12.

BORGONZONI (IL PADRE MAESTRO GIAMBATTISTA), born 1628, rebuilt the capella dei Reverendi Padri, when he designed in 1680 the four other chapels in the angles of the church della Carità, as well as the sacristy, of the Franciscan monastery at Bologna, to which he belonged. He also designed in 1686 the church of Sta. Maria della Vita in that city; the cupola was finished in 1787 by Giuseppe Tubertini. He died in 1692. 94. 105.

BORG SAN DONNINO. A small city in the province of the same name in the duchy of Parma in Italy, and created the seat of a bishopric in 1601. The Romanesque cathedral, dedicated to S. Dominus, was commenced about the beginning of the eleventh century, but the façade, illustrated by GALLY KNIGHT, *Eccles. Arch.*, fol., London, 1842, ii, 13, has never been completed: the crypt and the unaltered interior are deserving of notice, as well as the side entrances, which illustrate the zodiacal signs; thus *sol in ariete* has a porch with pillars resting upon rams, and having rams' heads in their capitals, while a radiated human head in the archivolt represents the sun; *sol in tauro* is symbolized by bulls' heads. The handsome *palazzo ducale* and the *palazzo pubblico*, in a Pointed style, four churches, several monasteries, a *collegio*, a *seminario* and other schools, an hospital, cavalry barracks, a theatre, public baths, an almshouse, and some large storehouses, are the only other buildings of importance. W. H.

BORG SAN SEPOLCRO. A city in Tuscany, created the seat of a bishopric in 1515. Its spacious and well-built streets, running at right angles to each other, are enclosed by walls having four gates. The three-ailed cathedral, dedicated to S. Giovanni Evangelista, is said to date from 1012; the churches of S. Francesco, with a rich Pointed portal; and of S. Antonio Abate, built in 1345, with five others; the chapel of the hospital, erected in 1348; several monasteries; the elegant *palazzo*, with a fine audience chamber and library; the town house and hall and market; the courts of justice and other public offices; the *seminario*; the theatre; and two hospitals, are the chief buildings. The town has repeatedly suffered from earthquakes. W. H.

BORGUND. A village between Hæg and Leirdalsören in Norway. The church is one of the oldest buildings in that country, and dates from the eleventh or twelfth century; the arches and the apse are semicircular, and have all the characteristics of a Romanesque church, as far as it can be imitated in wood, the church being built of pine, and protected from

the weather by thick coats of pitch. The nave is 39 feet, and the apse 15 feet in length: a covered passage about 3 feet wide runs round the body of the church. The interior is covered with extraordinary paintings. The belfry is detached. This, with other churches of the same style and period, is illustrated by DAHL, *Denkmale einer sehr Ausgebildeten Holzbaukunst*, fol., Dresden, 1837. Another church of this kind was purchased by the king of Prussia in 1837, who rebuilt it on the summit of a hill near his château of Erdmannsdorf in Silesia; D'OLFFERS, in MS. letter to T. L. Donaldson, dated Berlin, 31 July 1855.

BORIE'S CELLULAR ROOFING TILE. A tubular or a hollow roofing tile, holes being made through the thickness of the tile as if it were a brick, to render it a good non-conductor and an efficient ventilator. PRACTICAL MECHANIC *Journal*, 4to., Glasgow, 1853, vi, 220.

BOROBUDOR. The name given to an ancient Buddhist temple situated in the province of Kedu in the island of Java. It is a terraced structure of pyramidal form, about 526 feet square and 116 feet high, as described with illustrations by CRAWFURD in *Transactions of Bombay Literary Society*, 4to., Lond., 1820, ii, 156. It has four entrances corresponding to the cardinal points. The walls are covered with sculpture, and in 1815 nearly 400 images of the Buddhist worship remained within the precincts. With the exception of the dome the edifice is in nearly a complete state of preservation, although it is conjectured to date about 1260, according to CRAWFURD, *History*, 8vo., Edinburgh, 1820, ii, 197-223, who also gives plates of details.

BORRA (GIAMBATTISTA) of Turin directed the restorations of the church della Sta. Croce, and of the theatre, at Carignano, and erected the front of the palazzo Carignano at Racconiggi, near Turin. He accompanied Messrs. Wood and Dawkins to Baalbec and Palmyra, and his name appears upon the plates in the works which illustrate their visit in 1751 to those cities.

An architect named Borra was employed at Stowe, near Buckingham, in England. CIVIL ENGINEER, etc., *Journal*, xi, 258.

BORROMINO, also written BOROMINO (FRANCESCO), born in the territory of Bissano, near the Lago di Lugano, 25 September 1599, was the son of Domenico or Giovanni Domenico Castelli, afterwards called Borromino, who was an architect in the service of the family of the Visconti. Francesco was sent at either nine or fifteen years of age to Milan, where for seven years he studied sculpture and statuary work. Having proceeded to Rome, one of his relations, Lione Garogo, a master-statuary, provided him with employment at S. Peter's. Carlo Maderno, a kinsman by the female side, employed him as a draughtsman. When Urban VIII (Barberini, 1623-44) assumed the pontificate, he required so many designs and models for the works at S. Peter's, and for his brother's palace, that Maderno caused Borromino to give up the practice of sculpture. On the death of Maderno in 1629, both these undertakings were placed in the hands of Bernini, who was assisted by Borromino, not only at S. Peter's, but at the palazzo Barberini, which was Bernini's first great architectural work. Borromino quarreled with Bernini, and commenced the practice of architecture on his own account; Bernini's friends state that they do not know the reasons of the differences, which soon assumed the form of public disputes and private intrigue. LETAROUILLY, however, *Rome Moderne*, pp. 388-97, states that the palazzo, commenced in 1624 or 1625, was finished in 1630; and that the cardinal Barberini, who had given Bernini a share with Maderno in the work, saw his error and divided the employment, giving Bernini the front portion, and Maderno, or rather Borromino, the hinder portion, the vestibule, the right hand or oval staircase, and the *cordonata* or *scala a bastoni*, or inclined plane, and the back elevation; whereas FALDA, iv, 17, ascribes nearly all these works to Borromino; and D'ARGENVILLE attributes to him one of the façades behind the *manège*

and two staircases, one square, the other oval, supported by coupled columns. Other authorities state that the palazzo was not completed before the year 1639; before or about which time Borromino was employed by the pope in the design and execution of the church and monastery of S. Carlo alle Quattro Fontane (ROSSI, *Insignium Romæ Templorum*, 14-16; FALDA, iii, 12); as well as in the completion of the topmost story and the south façade (LETAROUILLY, 212-3, says the north) of the collegio della Sapienza, and the erection of its church with its bizarre lantern, dedicated to SS. Luca, Leon, and Ivo (ROSSI, pl. 40-42: the whole work is also illustrated in *Opera cavata da suoi originali*, fol., Rome, 1720). This building was not finished until the pontificate of Alexander VII; and D'ARGENVILLE attributes the church to Bernini.

LETAROUILLY, pp. 250-52, gives the highest credit to Borromino for the oratory, the library over it, the dwellings, and the cloisters of the oratorio di S. Felipe Neri in Vallicella, with its clock tower (ROSSI, pl. 31-33), and for his skill in planning the passages, the staircases, and the combination of the previously existing sacristy (built by Paolo Marucelli) with the new buildings: Borromino also completed the interior architectural decoration of the church. On the dismissal of Bernini from the post of architect to the collegio di Propaganda Fide, he was replaced by Borromino, who designed the west and south façades (FALDA, iv, 52), with the library, campanile, and church; the ornaments of the chapels and other parts were completed by Fontana. He subsequently held the appointment of architect to S. Peter's, in place of Bernini, and the commission, with a retaining fee of a sinecure office in the Cancellaria, to modernize the church of S. Giovanni in Laterano (ROSSI, pl. 11-13; LETAROUILLY, pp. 473-511), where he encased the ancient granite columns of the nave in the present piers, but preserved the ceiling (1650); and to lay on a supply of water from the fonte di Trevi to the piazza Navona, where Bernini placed a fountain; on the conclusion of the work Borromino was made in 1652 a *cavaliere*, with a gift of 3,000 scudi. About the same time the pope took from Girolamo Rainaldi the works at the church of Sta. Agnese in the piazza Navona, and entrusted them to Borromino, who designed the small college, the sacristy, the principal façade with its two campaniles, the cupola, and the decorations of the church (ROSSI, pl. 17-19; LETAROUILLY, p. 381); the work above the cornice of the first order, the plaster decoration of the interior, and the lantern, were transferred to Carlo Rainaldi (FALDA, iii, 6, says to Baratta); D'ARGENVILLE ascribes the sacristy to Bernini, and LETAROUILLY notices that the vault is attributed to that master. The king of Spain intending to enlarge his palazzo at Rome, procured designs from Borromino, in return for which the artist received the cross of S. Jago and 1,000 doppie. The design was not executed; and the same disappointment occurred in the case of the campanile of the church of S. Andrea delle Fratte, where he designed for the marchese del Bufalo the transepts, the tribune, and the cupola.

Among his other works were the unfinished church and convent of the Madonna dei sette Dolori, near S. Pietro in Montorio, for the duchesa Latera; the vestibule (which is ascribed by LETAROUILLY, p. 202, to Bernini), of the façade executed by Pietro da Cortona (looking towards the collegio Romano), of the palazzo Pamfili, now Doria; the Spada chapel on the right hand of the entrance to the church of S. Girolamo della Carità; the restoration of the palazzo Spada a Capo di Ferro, finishing the gallery and the adjoining portions, and executing the handsome colonnades in the garden, with the perspective corridor 30 feet in length, and diminishing from 10 feet to 4 feet in width, for the sake of effect; the restoration of the interior of the baptistery of Constantine, and of the façade of S. Giovanni in Laterano (the present front is attributed to his nephew Bernardo); the porta or portion of the palazzo Guistiniani facing the church of S. Luigi dei Franceschi (FERRERIO, 82, 83, says the whole of the palace, which is also said to have been begun

by G. Fontana in 1580); the remodelling of the façade of the palazzo Falconieri alla Morte in the strada Giulia (FERRERIO, pl. 72-75), which was left unfinished at the death of the cardinal; the Falconieri chapel in the church of S. Giovanni dei Fiorentini; the design or restoration of the palazzo called la Rufina for the same family at Frascati (FALDA, iv, 47); the chapel of S. Giovanni at the porta Latina, or rather its repair, in 1658 (LETAROUILLY, p. 166); the library and majestic new portion of the monastery of S. Agostino; the *scala lunaca* or winding plane to the palazzo Carpigna, afterwards Scavolino, at the fontana di Trevi, and the completion of that part of the same palace which remained imperfect opposite the church of SS. Vincenzo and Anastagio; the tomb of cardinal Ceva, near S. Giovanni in Laterano; the casino of the physician Messori outside the porta Pia; and at Naples the cappella Filomarino, also called del Tesoro and della Nunziata, in the church of the SS. Apostoli.

Borromino also made a design for the sacristy at S. Peter's, which was not executed. On the accession of pope Alexander VII (Chigi, 1655-67) Bernini was reinstated in his post of architect to that cathedral; and pope Clement IX (Rospigliosi, 1667-70) was equally disposed to support Bernini; whose journey to Paris brought the jealousy of Borromino to such a point that he became hypochondriac: he travelled for a short time in Lombardy; returned to Rome, and occupied himself in making a large number of drawings, which together with his collection of executed designs he burnt; and at last stabbed himself on the night of 1 August 1667, and died twenty-four hours afterwards. He was buried by the side of Carlo Maderno in the church of S. Giovanni dei Fiorentini. Borromino would never compete, enter into connexion with builders, or sign the drawings made by his pupils. His drawings of the churches of the Sapienza and S. Felipe Neri were engraved by Barriera, and were published by Sebastian Giannini, fol., Rome, 1720.

31. 32. 42.

His nephew and only pupil BERNARDO (BORROMINO?) is said to have designed the façade of S. Giovanni in Laterano, since replaced by another designed by Galileo. He died 25 January 1709, and was buried in the church of the Madonna del Popolo.

42.

BORT (JAYME) finished before 1762 the principal front of the cathedral at Murcia in Spain.

66.

BORT (JULIAN) about 1750-60 designed the principal front of the cathedral at Lugo, in the province of Galicia in Spain.

66.

BORTOLO IL MANOPOLO, see ALESSANDRO (BORTOLO n°).

BOSA. A seaport city of the province of Sassari in the island of Sardinia. It is built on a hill crowned by a ruined castle, and is enclosed by decayed walls. The only building of importance in its single street is the old cathedral, dedicated to S. Pietro, and also to Nostra Signora delle Nevi, three monasteries in the Pointed style, and a *seminario*.

96.

BOSBOOM (SIMON), born at Embden in 1619, was employed by the elector of Brandenburg on the residence and other buildings at Berlin, and was subsequently established at Amsterdam, where he died in 1688. He assisted Jacob van Campen in building the *Stadt-haus* in that city; and published *Cort Ouderkerck de vyf Colonnen*, fol., Amsterdam, 1670, 1676, and 1679; SANDBART, *Teutsche Academie*, fol., Nuremberg, 1768, vii, 384. His son Dirk, born at Amsterdam about 1670, was a partner with Schynvoelt; and they also published a work upon architecture.

24

BOSCH Y RIBA (ANDRES), elected into the Royal Academy of S. Fernando at Madrid 8 May 1779, died in 1796.

66.

BOSCRI or BOSCRIT (PIERRE), called BOSERY by VIRLOYS, studied in Italy; and on his return to France designed in 1726 the gateway (opposite the *rue de Bussy*) and perhaps the other buildings of the market of the abbaye de S. Germain des Prés at Paris. He was subsequently much employed in that city and its environs: he designed the country house of M. de Mont-

martel at Brunoy, a very considerable work, which was continued by Roussette; in 1736 the rebuilding of the collège des Irlandais, also called des Lombards, in the *rue des Carmes*, near the *place Maubert* at Paris; and in 1738 its chapel, which is illustrated by BLONDEL, *Architecture Française*, fol., Paris, 1752, ii, 89.

BOSNASERAI, also called SERAI and SERAJEVO. The capital of the province of Bosnia in European Turkey. As the houses are chiefly of wood painted, it presents a rather gay appearance. The town contains a palace or *serai* built by Mahmoud I. or II., 1413 to 1481; upwards of a hundred mosques; four Christian churches; three monasteries; two large bazaars; and several baths, schools, and other charitable institutions. The iron mines in the vicinity are important. The gilt and tinned vessels of copper which are sold in the Turkish markets are chiefly made at this place.

BOSPORUS in the Crimea, the ancient name of KERTCH, see PANTICAPAEUM.

BOSQUET. A French term adopted in the English language to express a piece of ground in gardens enclosed by a *palissade* or high hedge-row of trees, made of hornbeam or elm, in preference to maple, yew, or box: the interior space when small is called a *cabinet de verdure*, when large a *salle*, which had a particular name, according to its use, its plants, or its decoration; thus in old gardens there are *salles de bal*, *de comédie*, *de manonniers*, *de tilleuls*, *de Diane*, and *de Neptune*. The beauty of these bosquets was supposed to consist chiefly in the fountains, summer-houses, and other decorations which embellished them and their entrances from the open ground.

BOSS, formerly also written BOCE (Fr. *clef*; Ger. *bucket*). An ornament which, originally placed to conceal the intersections of ribs on flat or groined ceilings, was afterwards introduced as a decoration on horizontal and upright moldings, as well as in other situations, and finally became the principal feature of a ceiling in the form of a PENDANT. The term strictly means a mass of material with a very convex section; so that the rosettes, pateras, and buttons of the Romanesque architecture which are found at the intersection of ribs, hardly deserve the name of bosses. In the First Pointed period the boss assume its peculiar character of a nearly hemispherical body carved into foliage, and into figures and animals in some few cases. In the Second Pointed period one or more leaves of foliage, heads, figures, and animals, alone or mixed with one or more of the others, as well as escutcheons, appeared as the decoration of bosses, which no longer affected to be strictly round in plan, nor to be positively curved in section. In the Third Pointed period the boss became square on plan, of which the handsomest examples are probably those at Windsor; the same subjects as those employed in the preceding style were used; but escutcheons, badges, and other devices are abundant; a *fleur-de-lis* on a circular ground at Windsor is peculiarly effective. One peculiar phase of the boss was that in which the stone ornament assumed the appearance of a perforated molded and carved board placed upon the most projecting portion of the work which it was to conceal. On the continent, as in England, a small circle of moldings corresponding with those of the ribs is sometimes used as a substitute for the boss; and it has been suggested that pendants or other ornaments were originally let into these circlets. WEBB, *Sketches*, 8vo., London, 1848, p. 34, asks whether it is the rule that the devices of bosses employed in the roof of a church should face the spectator looking up from the west.

BOSS. A short trough for holding the mortar employed in tiling or slating a roof; it has an iron hook by which it may be suspended to the lathing of the roof or to the rounds of a ladder.

2.

BOSsing. The act of making gutter beads, etc., out of solid lead by means of the beater, without doubling or soldering; all work of this kind should be described as "to be bossed out of the solid."

A. A.

BOSTON. The capital of the state of Massachusetts in the United States of America. Boston, or Old Boston, is situated on a peninsula; South Boston was added to the city in 1804; and the town, although small in itself, became important as the centre of a dozen suburban villages on the mainland, with which it communicates by a stone dam about twelve furlongs in length, called the Western Avenue, and by six timber bridges formed on tressels, varying from 6,190 feet, or without the causeway from 2,796 feet, to 500 feet in length, as well as by a similar number of equally important railway bridges. East Boston was commenced in 1833. This city is especially remarkable for two hundred jetties running into the sea; they are called wharves, and form a kind of docks by their proximity to each other. Equally remarkable are the icehouses; for, exclusive of those on the wharves at Charlestown and East Boston, in which ice is stored for short periods, there were erected in 1847 and previously, houses capable of holding 141,332 tons. The city was supplied with fresh water in 1795 from Jamaica pond in Roxbury, about four miles distant; and in 1846-53 from Cochituate lake, formerly called Long pond, in Framlingham, whence it is taken in an oval brick channel 6 feet 4 inches high by 5 feet wide and 14½ miles long to Brookline on the main land, where there is a magnificent reservoir; it is described in the *BUILDER Journal*, vii, 6. Some of the old timber plastered dwellings remain; but the town is chiefly brick, although of late years granite has been a favourite material.

The State House, erected 1795-98, at a cost of 133,330 dollars, fronts a common of 75 acres in extent, of which one-third was enclosed in 1837 as a botanic garden: the building is 173 feet long, 61 feet deep, and has a dome of 52 feet in diameter with a cupola or lantern; the lower story contains a public hall 50 feet square and 20 feet high, divided by Doric columns, which carry the floor of the hall of Representatives, which is 55 feet square; on the first floor is also the senate chamber, 55 feet long, 33 feet wide, and 30 feet high, with two screens of Ionic columns supporting a richly decorated arched ceiling; there is also a council chamber 27 feet square, and other offices. Faneuil hall, built 1740-42, was originally 100 feet long by 40 feet wide, but the width was doubled in 1805: the lowest floor is let out as shops; the next contains the great or public hall, 76 feet square and 28 feet high, with Doric columns to the three side galleries, and Ionic columns supporting the floor of the upper room. The new custom house, designed by A. B. Young in 1838, is cruciform in plan, 140 feet long, 95 feet wide, and 90 feet high to the foot of the dome: the long arms are 75 feet, and the shorter 67 feet wide, and each front has a hexastyle Doric portico standing on fourteen steps; the columns are 32 feet high, and 5 feet 4 inches in diameter, monolithic and fluted, each cost 5,000 dollars: the building stands on a basement or sunk ground floor 12 feet high, placed on a platform of granite 18 inches thick resting on 3,000 piles. The merchants' hall or exchange, finished in 1842, cost 175,000 dollars; it is 250 feet long, with a frontage 52 feet wide and 70 feet high, having the post office in the centre of the ground floor, the front occupied by banks and insurance offices, the rear by an hotel; in the centre is the exchange and reading room, 80 feet long by 58 feet wide, with eighteen Corinthian columns 20 feet high; the ceiling has a stained glass skylight in a wrought iron roof. The Faneuil hall or Quincy market, by A. Parris, constructed of granite in 1827 at a cost of 150,000 dollars, is 536 feet long, 50 feet wide, and two stories in height; the centre portion is a mass 74 feet long, 55 feet wide, and 77 feet high to the foot of the dome; each end of the wings has a tetrastyle Greek Doric portico with columns 23 feet high. Boylston market and hall also deserve notice. The court house, by A. Parris, a granite structure 176 feet long, 54 feet deep, and 57 feet high, with Greek Doric porticos on the north and south fronts, contains four courts, each 50 feet long by 40 feet wide, besides the necessary public offices. The city hall is behind this building; and in the immediate neighbourhood is

the old town hall, built in 1714, which was burnt and the interior restored in 1747, since which it has been called the old state house; it is 112 feet long by 36 feet wide, and has been used since 1830 for public offices.

The seventy-four churches and chapels are not of so much importance; although one is a Roman Catholic cathedral, dedicated to the Holy Cross: two churches of freestone, designed in a Pointed style by — Billings, were erected in 1827; and Trinity church, of granite, was erected in a Pointed style in 1829; King's chapel, built of rough stone in 1754, with a Corinthian colonnade in front, is considered, although faulty in detail, to be superior to most of the edifices erected in New England during the eighteenth century. The Tremont Temple, designed by William Washburn, was built in 1852-3, at a cost of 100,000 dollars, including fittings, etc. It is 94 feet wide, 36 feet deep, and 75 feet high, and contains three halls, respectively containing 2,500, 900, and 300 persons, with numerous other rooms for offices, etc.; the walls are built hollow for the sake of resonance, and of obviating danger from fire; *BUILDER Journal*, xi, 232. Many of the churches and most of the edifices built on Beacon, Tremont, and Somers-streets, since 1815, are placed amongst the structures designed by A. Parris.

There are many charitable institutions: amongst those which have the largest or best structures are the Massachusetts general hospital, built of granite in 1811 by A. Parris; its branch establishment, the M'Lean asylum for the insane, built in 1818, for 200 patients; the blind school; the eye infirmary; the houses of industry (1823), 220 feet long by 43 feet wide, and of correction; and the new gaol, designed by Gridley J. F. Bryant (*BUILDER Journal*, vii, p. 207); it is chiefly remarkable for the amount of light which may be given to the cells in comparison with that afforded to those in other prisons constructed upon the same, viz. the Auburn, principle; the same architect, in conjunction with Louis Dwight, erected in 1850 the almshouses on Deer Island for 1,200 immigrant paupers (*BUILDER Journal*, viii, 290, 294). Among more than a hundred societies which have good houses, the best accommodated are the medical college, a brick building; and the natural history society, in the old medical college; the atheneum, a Palladian structure, built about 1849 of freestone from New Jersey, is described in the *BUILDER Journal*, vii, 404, as being 114 feet in length and 62 feet in height: the Masonic temple, occupied as an Unitarian chapel, and nine or ten buildings called halls, are open for public or private occasions.

The Boston theatre, built in 1798, is 152 feet long, 61 feet wide, and 40 feet high; it was converted into a chapel and called the Odeum in 1836, and has been recently reconverted into a theatre; the national theatre was built in 1831; the new Boston museum is also a theatre; thus resembling the Howard atheneum, which was built at a cost of 100,000 dollars, and is allowed to be one of the handsomest buildings of its class in the States; the theatre built in 1852, 90 feet in diameter by 54 feet high, is described at length in the *BUILDER Journal*, xii, 562; the music hall, 130 feet long, 78 feet wide, and 65 feet high, erected 1852, seating 2,700 persons, by Messrs. Snell and Morse, is noticed in the same periodical, x, 803; these are the chief other buildings of importance, except the establishments of more than fifty shareholding companies (State-street is lined with handsome banking and insurance offices, chiefly of granite) and five or six hotels, one of which, built also of granite with a Doric portico in 1829, at a cost of 68,000 dollars, has been illustrated by its architect, J. ROGERS, *Description of Tremont House, etc., and the Art of Constructing Fire-Proof Buildings*, 4to., Boston, 1830. Another was erected on the site of the old Liberty Tree; it is of brick, four stories in height, 90 feet long by 77 feet wide; in the second story is a hall 75 feet by 30 feet; in the third another hall 80 feet long, 40 feet wide, and 30 feet high, with two large drawing rooms, and a supper room 75 feet by 35 feet; and on the fourth story is a hall 75 feet by 30 feet, and another 60 feet by 40 feet, with

convenient drawing rooms; *BUILDER Journal*, viii, 154. A plan of Boston is given in the *Maps of the Society for the Diffusion of Useful Knowledge*. HINTON, *History and Topography*, 4to., London, 1842, gives views of the state house, pl. 61; the general hospital, pl. 42; and the monument of 17 June 1775, erected on Breed's-hill, pl. 23: this is an obelisk of granite, of which the first stone was laid in 1825, but sank, and was relaid in 1827, but the monument, which rises abruptly from the pavement, is 30 feet square at base, 15 feet (or 16 feet 4½ inches) square at top, and 220 (221) feet high, formed of eighty courses of 2 feet 8 inches each, to the level of the top landing of the staircase. The interior is 10 feet 7 inches in diameter at the base and 6 feet 4 inches at the top, and has 294 steps. The *CIVIL ENGINEER Journal* for 1838, i, 390, mentions the extensive use of iron and tin plates for acoustic and decorative purposes at one of the theatres. The *BUILDER Journal*, viii, 87, gives the roof, 94 feet span, erected about 1850, over the depot of the Boston and Albany Railway.

In the neighbourhood a species of soap stone is found, which is quarried to some extent, and used instead of fire-bricks in situations exposed to high temperature.

BOSTON. A well built borough, port, and market town in the county of Lincoln. It is only necessary to mention it for the church, dedicated to S. Botolph, which has been restored and repaired, at a cost of £3,830, under Messrs. Scott and Moffatt, between the years 1843 and 1846; their report is given in the *CIVIL ENGINEER*, etc., *Journal*, ix, 235. The edifice consists of a nave 150 feet long and 38 feet 6 inches wide, or 98 feet 6 inches wide inclusive of the aisles, which are the widest in England in proportion to the nave; and of a choir 87 feet long and 28 feet wide, with a tower at the western end of the building 22 feet 5 inches by 26 feet 5 inches square at the base; all these being the dimensions internally. It is the largest church in the United Kingdom *without cross aisles*, a character which might be expected, since Boston was the second commercial city in England at the time of the erection of the edifice. The church is supposed to have been commenced in 1309; the original west wall was finished complete before the erection of the present tower; the nave and long walls of the aisles are of the Decorated period, and the remainder of the work, as it progressed, Transitional and Perpendicular, with part of the aisle parapets on the north side in the Tudor style of Henry VIII. BRITTON, *Views and Details of the Architectural Antiquities of Great Britain*, 4to., London, 1814, iv, 119, and *Chronological History*, 4to., London, 1835, v, 64-5, gives a view of the church and a geometric section of the tower, which is there shown 266 feet in height, but stated by Scott at 269 feet 5 inches, and by others at 282 feet. It was left unfinished, and from the putlog-holes remaining in the octagonal lantern, which is visible for a distance of forty miles, it is probable that, at the dissolution of the monasteries, the scaffolding still surrounded the edifice. The chancel, which originally had only three bays, had been lengthened during the reign of the Perpendicular style. In 1851-53 the church was further repaired and embellished, under Mr. G. G. Place of Newark, with the advice of Mr. Scott; *BUILDER Journal*, ix, 301, x, 86, xi, 328, at an estimated cost of £3,000. The town is also remarkable for its iron bridge of one arch, 86 feet 6 inches (85) in span and 39 feet (36) wide, erected at a cost of £22,000 including the purchase of buildings, in 1804-7, from a design by John Rennie. FISHEY THOMPSON, *Collections, etc., of Boston*, 4to., London, 1820; *Churches of Holland in Lincolnshire*, 8vo., Boston; WICKES, *Towers*, etc., fol., London, 1855, ii, pl. 19.

BOTANY. The science which comprehends all that relates to the vegetable kingdom. The mere nomenclature and classification of plants would be a subject of comparatively useless study to the architect, except as regards the discrimination between the varieties of timber trees; but it is necessary as a preparation to the consideration of their structure and mode of

growth, which as influencing the cohesive powers, elasticity, and preservation of timber, deserve his careful attention; a knowledge of the causes of their different appearances will be frequently found useful as regards the artistic employment of plants; and the more easily the observer can distinguish even between varieties of the same plant, the more readily he will seize upon the accidents of form and colour in regulating his proceedings in employing, conventionalized or not, their various portions. Most manuals of botany teach the variations of form, outline, position, and other conditions of plants and their parts; among the best are ARCHER, *Popular Economic Botany*, 8vo., London, 1853; BALFOUR, *The Class Book of Botany*, with upwards of 1,800 illustrations, 8vo., Edinburgh, 1854; LINDLEY, *The Vegetable Kingdom, or the Structure, Classification, and Uses of Plants*, 3rd edit., 8vo., London, 1853; LINDLEY, *The Symmetry of Vegetation; An Outline of the Principles to be observed in the Delineation of Plants*, 12mo., London, 1853; which are appropriate for the landscape gardener. *Botany*, by the SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE, 8vo., London, 1838.

Among subjects of archæological inquiry, none have been less regarded than the employment of plants as ornaments in architecture. The field is wide; from the reed and the lotus of the Egyptians, the pomegranate and the lily of the Hebrews, the ivy and the myrtle of the Etruscans, the olive and the pine of the Greeks, the oak and the laurel of the Romans, the palm and the vine of the early Christians, to the unconventionalized employment of every local plant by the Mediævalists and the later builders more or less to the present time, there is scope enough for a large volume, and for a lifetime of research; the endeavour to illustrate the subject must therefore be confined to some of the leading plants, as ACANTHUS. The following works may be consulted as to the plants which are supposed to have been chiefly used in mediæval architecture, but which are often so varied, if they have been employed, as to be unrecognizable in sculpture by unlearned and unprejudiced eyes. RAMÉE, *Manuel de l'Histoire*, 12mo., Paris, 1843, ii, pp. 16, 166, 332; BOISSERÉE, *Geschichte*, etc., von Köln, 4to., Stuttgart, 1827; METZGER, *Gesetze der Pflanzen und Mineralienbildung angewendet auf Altheutschen Baustyl*, 8vo., Stuttgart, 1835; SAUBINET, quoted in the *Handbook to the Mediæval Court* at Sydenham, gives a list of the flowers, fruits, etc., on the cathedral at Rheims, amounting to above twenty different species, the most usual being the vine, ivy, laurel, oak, and ranunculus; GRIFFITH, *Paper* read at the Royal Institute of British Architects, November 1854; to which may be added the list of flowers for the principal immovable festivals of the year, as given in the *ECCLÉSIOLOGIST*, vi, 217, and enlarged vii, 103.

The following works relate to the suggestions which have been made for adopting various plants as the bases of more novel ornamentation. GRIFFITH, *Architectural Botany, or Geometrical Distribution of Foliage*, 4to., London, 1852; WHITAKER, *Materials for a New Style of Ornamentation, consisting of Botanical Subjects and Compositions drawn from Nature*, 4to., London, 1849; CHAVANT, *Musée des Dessinateurs de Fubrique* (600 plates of flowers illustrative of ornament), 4to., Paris, 1838; METZGER, *Ornamente aus Deutschen Gewächsen*, fol., Munich, 1841; EBERHARD, *Typen Pitoresk-plastisch Architectonischer Ornamente aus der Vaterländischen Flora*, etc., 4to., Leipzig, 1828, 1843, and 1846; MOSBACH, *Grotesques from Flowers*, 4to., 1626; HARVEY, *Botany considered in reference to the Arts of Design*, 8vo., Dublin, 1849.

BOTANY BAY OAK, see BEEF WOOD; CASUARINA; and ROBINIA.

BOTANY BAY WOOD, see BLACK WOOD.

BOTERACE FAUX. The old term for a buttress with a false bearing, as explained by WILLIS, *Nomenclature*, 4to., Cambridge, 1844.

BOTERASSE or BOTTRASSE, see BUTTRESS.

BOTERELL (JOHN) was the "clerk of the works" to the

renovation of Westminster Hall in London by Richard II in 1397. STRYPE, *Continuation of Stow, Surrey*, fol., London, 1720, ii, 627; BRAYLEY, *History of the Palace of Westminster*, 8vo., London, 1836, p. 437.

BOTHIE, a little Booth. The term common in the north of England and in Scotland for the one-story dwellings of agricultural labourers; the size is regulated by the number of persons for whom it is designed, two being accommodated in each bed, but since 1840 bothies have sometimes been built with an upper story for beds. 8.

BOTHOM NAIL, also called **BACK** or **BOTTOM NAIL**. A nail formed with a flat shank so as to hold fast and not open the grain of the wood into which it is driven; it is used for fastening together the planks or boards of any trough or vessel intended to hold water. **CLENNAIL**. 4.

BOTT (JEAN DE), see **BODT** (JOHANN VON).

BOTTLE. The manner in which **BOITEL** was written about the year 1674. 16.

BOTTOMING or **BALLASTING**, see **METALLING**.

BOTTOM RAIL. The name given to the lowest rail of a door, partition, or window sash.

BOUCHARDON (EDMÉ), born in 1698 at Chaumont near Bassigny, was also a sculptor. From his design the *fontaine de Grenelle*, in the street of the same name in Paris, was commenced in 1739 and completed in 1745. He became a member of the *Académie Française*, and died at Paris in 1762. **DUVAL**, *Fontaines*, fol., Paris, 1812; **LEGRAND** and **LONDON**, *Description*, 8vo., Paris, 1808, iii, 69. 14.

BOUCHER (JEHAN LE), *maître de l'œuvre* of the church of S. Maclou at Rouen, was one of the artists commissioned 27 January 1509 to report upon the designs made by the Leroux for the portal of the cathedral at Rouen. **DEVILLE**, *Recue des Architectes*, 8vo., Rouen, 1848.

BOUDOIR. A French term which literally signifies a pouting place, and was used for the name of a lady's apartment in which the occupant chose to be alone: it is now recognized as the designation of a room in a large mansion especially appropriated to the apartment of the mistress of the house, and fitted up either as a study or a reception room, as a morning room or a cabinet of curiosities. In the private houses of London erected during the eighteenth century, the third and smallest room on the first floor seems to have been intended for the boudoir: in many country mansions it was placed as near as possible to the chambers and dressing rooms. The term does not appear on plans, nor in the Dictionary of the *Cours* by **DAVIER** of the year 1760, but it is inserted in the Dictionary by **VIRLOYS** of the year 1770. 6.

BOUDROUM. The modern name of **HALICARNASSUS**.

BOUE (JEAN JOSEPH), born at Salèles in 1784, was a pupil of Delagardette. He erected several buildings at Montpellier and other places, and made many designs for the façade of the church of S. Matthieu in that city. 68.

BOULDER WALL. Upon the sea shore, or in districts where diluvial detritus abounds, as in the upper valleys of mountain torrents, the larger masses of stone, or boulders, as they are generally termed, left by the currents, are used for **RUBBLE MASONRY**. For ordinary external walling, or for backing up dressed ashlar when the thickness of the whole body of the masonry is considerable, there can be no objection to their use; but it is essential that the bond should be carefully observed, and that the mortar used should be of the very best description. In fact the rounded form assumed by boulders, which generally is that of an oblate spheroid, renders their use highly objectionable in positions where the masonry would have to receive heavy loads before the mortar became consolidated; their use is therefore almost exclusively confined to the districts in which they occur in great numbers. Great care is required in the construction of such a wall, especially in filling in the spaces between the larger stones with others of smaller size. They should not be thrown in as is too frequently

done, but laid by hand, the major axis being horizontal, with just sufficient mortar to keep them from touching the stones next to



technically called 'necking'. Men working equally should be employed on both sides of the wall at the same time, and the best lime must be used, and should be obtained as fresh as consistent with safety. **LIVERPOOL ARCHITECTURAL SOCIETY**, *Proceedings*, etc., 4to., Liverpool, 1852, i, 189.

The difficulty of making the work stand, especially if executed in damp weather, has led to the expedient of laying laths in the wall angleways, and then crossing them chequerways at the height of every two or three feet. The old system of valuing this sort of walling was by the square of 100 feet. The specific gravity of a boulder wall executed with good hydraulic mortar may be taken at between 2.23 and 2.25; the crushing weight that masonry of this description would bear, for a short period, can hardly be considered to be more than 50 lbs. per inch superficial, nor would it in practice be safe to place upon it a permanent load of more than one-sixth of the above instantaneous crushing weight. G. R. D.

BOULE WORK, see **BUHL WORK**.

BOULÉ or **BOULÉE**, see **BOULLÉE** (ÉTIENNE LOUIS).

BOULEUTERION. The name belonging to the place of meeting of the Boulé or senate of a Greek city; such as the Council of Five Hundred at Athens, where the senate house contained a shrine dedicated to Jupiter and another to Athena. The building appears to have been a public court. **CICERO**, *Verr.* 4, mentions the curia so called at Syracuse; and **PLINY**, *Hist. Nat.*, xxxvi, 23, mentions by this name the senate house at Cyzicus and its roof, which he considered remarkable.

BOULEVARD. A bank of earth with a terraced top and a covering of turf was the original bastion, (It. *balcardo*, or (Fr.) *boluvert*, which towards the end of the fifteenth century replaced as an advanced fortification the barbican of preceding times. The boulevards between the porte S. Honoré and the porte S. Antoine at Paris date from 1536; and five or six of the masses of earth may still be recognized behind the old houses. At the end of the sixteenth century the stone bastion superseded the earthen boulevard, but the appellation was retained for the promenades planted with trees which occupied the place of the old fortifications. It is also the name given to a public walk shaded by avenues of trees on the outskirts of cities and towns on the continent. 10.

BOULINGRIN. This French term, which appears to be derived from the English words **BOWLING GREEN**, has no equivalent in our language except *basin*, which is appropriated to the reception of water: the *boulingrin*, as may be seen in a good example on the south side of Kensington Gardens, is properly a piece of verdure of any plan that will allow of its being dished out in the centre so as to form a regular slope all round the outline: the usual mode of decorating it was with a pond and fountain; a good effect is however produced when it is nearly filled with heath, thyme, etc., or when it is treated as a formal parterre. 5.

BOULLAN, or **BOULLAND** (JEAN BAPTISTE VINCENT), born at Troyes in 1739, was a pupil of Blondel, and in 1771 clerk of the works under Antoine at the hôtel des Monnaies in Paris, where he became architect to the cathedral of Notre Dame, and in 1781 *architecte inspecteur du Palais Royal*. He

died in 1813. The chapel de la Communion in the church of S. Nicolas des Champs at Paris, now the parish church of the sixth arrondissement, was designed by him, who therein employed a kind of perspective architecture; LEGRAND and LONDON, *Description*, 4to., Paris, 1808, i, 150. 106.

BOULLEE, sometimes written BOULÉE (ETIENNE LOUIS), born at Paris 12 February 1728, was the son of an *architecte juré expert des bâtimens*, who placed him at first with Pierre, *premier peintre du Roi*, under whom he obtained a medal, and then with Lejai, first architect to the king of Prussia. His principal work was the hôtel de Brunoy in the faubourg de Roulle, Champs-Élysées at Paris, which is considered to form an epoch in the history of French architecture. As specimens of the numerous houses in the chaussée d'Antin, and country houses in the neighbourhood of Paris, and of the châteaux which he constructed in all parts of France, may be cited the châteaux de Tassé at Chaville; de Chauvri at Montmorency; du Péreux; a house at Issy; the hôtel d'Evreux; he also designed the decorations for several handsome interiors of dwellings, being commissioned by Messrs. de Beaujon and de Monville. Boullée published *Mémoire sur les Moyens de Procurer à la Bibliothèque du Roi les Avantages que cet Monument exige*, fol., Paris, 1785. After having been for a long time *architecte du Roi* and (1762) member of the Academy of Architecture, he was named a member of the *Académie des Beaux Arts*, 12 December 1795. He died 6 February 1799. Messrs. Brogniart, Chalgrin, Durand, Durème senior, Gisors, were among his pupils, as well as his nephew Bénard, to whom he left his manuscript *Essai sur l'Architecture*.

The BIOGRAPHIE NOUVELLE DES CONTEMPORAINS, s. n., gives Boullée the credit of being the first to oppose the style Louis Quinze, and states that he published a collection of designs, including plans for the completion of the Madeleine, the restoration of the châteaux de Versailles and S. Germain, the bibliothèque nationale, and the tomb of Newton.

BOULOGNE SUR MER (the Latin GESORACUM and BONONIA). A seaport city in the department of the Pas-de-Calais in France. It consists of two portions, the upper and the lower or modern town; the former of which was fortified by Simon de Villers in 1231 with walls including a less space than the Roman town, and with a citadel or castle at the eastern corner. These defences were strengthened on the departure of the English garrison in 1550 by fresh works and some towers: the latter were destroyed in 1687. In the walls are three arched gateways, a boulevard or bulwark, and the castle; this is now used as an armoury, barrack, and powder magazine; TAYLOR and NODIER, *Voy. Pit.* (Picardy), vol. iii, fol., Paris, 1848, who also illustrate other objects in the city and neighbourhood. When the towers were built in 1550, a wall, parts of which remain, was also raised round the new town or suburb that had risen during the English occupation on ground left by the recession of the sea. On the north side of the city an open space called the *Tinterelles* adjoins new streets of elegant houses: while on the opposite or left bank of the river Liane there is a kind of suburb called *Capécure*. The *haute ville* has narrow and irregular streets of good houses, and contains the *hôtel de ville* (an ancient tower behind called the *Beffroi* formerly belonged to the palace of the counts of Boulogne, of which it is the sole remnant); the *palais imperial*; the *palais de justice*; the episcopal palace, now a school; the *maison d'arrêt* or prison; the cathedral, in a modern Greek style, commenced in 1827 on the crypt erected in the eleventh century for the previous edifice, which was destroyed in the Revolution of 1789; and some ecclesiastical establishments of little importance. Besides these public buildings, the town contains the *hôtel de la préfecture*; the barracks; the former *grand séminaire*, now the public museum, library, and picture gallery; an hospital; and a building erected about 1830 for various charitable purposes; three churches, which were repaired 1626-30; three convents; five Protestant chapels; a handsome railway terminus; two custom

houses; a theatre; and two concert rooms. The bathing establishment, with its reading, music, assembly, and card rooms, is cited as a model of such arrangements on the continent.

A little distance to the west of the town is a square pedestal on steps surmounted by a Doric column of marble from the neighbouring quarries of Marquise, 13 feet in diameter, supporting a statue 16 feet high of Napoleon I: the whole height, excluding the statue, is 164 feet.

BOULTEL, see BOLTEL.

BOULTIN, or BOULTINE. The bouldins of capitals of the Tuscan, Doric, and Ionic orders, and also of the bed-moldings of the Doric, Ionic, and Corinthian cornices, which are mentioned in writings of 1736, are evidently the ovolos employed in those situations. OVOLO.

BOUMAN or BOUMANN (JOHANNES) was born at Amsterdam in 1706. He went to Potsdam in 1732 as court architect, and there erected the buildings called "the Dutch houses". Under Frederick II he superintended the building of the Berliner Thor; the *rath-haus* or town hall; the French church, an imitation of the Pantheon at Rome, but of the Doric order, finished in 1752; and many other works. In Berlin several structures were erected under his superintendence; especially the *Domkirche* (1750); the palace of prince Henry, now the university buildings (1754-64); the mint; the invalid establishment; and the new *Ritter akademie*. He was *oberbaudirektor* at his death in 1776. 24. 68.

BOUMANN (JOHANN FRIEDRICH), his son, born at Berlin in 1737, was a colonel of artillery. He built in 1777 the royal library at Berlin (NAGLER) but ascribed to Fischer von Erlach; the dome, raised on twenty-four Corinthian columns, of the church of S. Hedwig in that city, where the King's bridge was erected by him and Gontard; in 1783 the theatre at Schwedt; and in 1785 the angle pavilions of the *schloss* at Rheinsberg. 68.

BOUNDARY STONE (Fr. *borne*). A tablet, post, or pillar, erected to mark the extent of household or landed property. OCKLEY, *Hist. of the Saracens*, 8vo., London, 1848, p. 176, mentions one decorated with the statue of the reigning emperor Heraclius. On the continent these marks are frequently treated as architectural features; and during the seventeenth and eighteenth centuries they received some attention also in England, but at present, except in the city of London, plain cast iron posts or stone blocks generally supersede any ornamental designs for such matters. TERMINUS. 25.

BOUND MASONRY, used in old works for BOND MASONRY.

BOUQUET. A term which has been sometimes used by English writers for the crop of a finial. 22.

BOURBONNOIS MARBLE. A marble of a dirty red and bluish grey colour, mixed with dirty yellow veins. It is chiefly used for the compartments of pavements, as in the *galerie du Nord*, on a level with the chapel at Versailles.

BOURCHEIT (..... von), a German, was largely employed in Belgium. 98.

BOURGES (the Latin AVARICUM, BITURIGÆ, or BITURIGES). The capital of the province of Berry, and now of the department of the Cher, in France. The city is surrounded by promenades formed upon the old ramparts, which are about two miles in circuit: the streets, which are narrow, steep, and tortuous, contain shops with gabled timber fronts, having great similarity in design, and private dwellings enclosed within blank walls of their courtyards. The chief antiquities of the town consist of the ruins of an ancient fortress with walls 18 feet in thickness; and of six or seven of the towers of the fortifications, two of which, apparently of Roman work, are opposite the *cours Serracourt*; one of the large *places* occupies the site of the amphitheatre.

The cathedral, dedicated on its completion 5 May 1324 to S. Etienne, is considered to be one of the finest in France; it is described by BOURASSÉ, *Cathédrales de la France*, 8vo., Tours, 1843, as having crypts constructed in the twelfth century,

and north and south portals belonging to the style *Romano-Byzantine*; and nave and aisles of the style *ogivale primaire*; but with vaulting of the style *ogivale secondaire*, to which period the western five-arched entrance belongs; ROMÉLOR, *Description de l'Eglise*, 8vo., Bourges, 1824, ascribes the construction of the crypt and the foundation walls up to the level of the ground to bishop Raoul de Turenne (840-866), the walls up to the vaulting to his eleven successors, ending with Gauslin (1030), and the completion of the vaulting to the thirteenth century, as shown by the arms of the two Sullys, the last of whom died in 1280. The northern tower, called the *tour de beurre*, belonging to the style *ogivale tertiaire*, was erected by Guillaume Bellevoisin or de Pellevoisin, and is 217½ feet high; the first stone was laid 19 October 1508, and the building was finished in 1538; it replaces the *tour de S. Etienne*, built during the years 1490-1506, which fell 31 December 1506, three months after the works were completed. The southern tower, called the *vielle tour* and the *tour soude*, is only 176 feet high, and is not so handsome. This edifice is illustrated by LABORDE, *Monuments*, fol., Paris, 1816, pl. 171, 191, 192, who gives a view of the façade and of the southern entrance, and a plan. The building inside is 380½ feet long, 135½ feet wide, and 124½ feet high; there are no transepts, but four aisles with external chapels to the nave, which is 41 feet 6 inches wide between the columns; the inner aisles are 71 feet high and 16 feet 6 inches wide, and have a triforium and clerestory. The choir has the triforium and clerestory both of the nave and the aisles returned round the eastern end. The outer aisles are 31 feet 9 inches high and 16 feet 6 inches wide. Besides the fifty-two remaining stalls (1760) in the choir; the SEPULCHRE (1336, but repaired 1543 and 1640) in the crypt; the tomb of John the Magnificent, duke of Berri, illustrated by HAZÉ, *Notices*, 4to., Bourges, 1834, pl. 39-52; the statues of the marshal de Montigny, and of three members of the l'Aubespine family; the chapter house (before 1380); the presses in the charter-room, the sacristy, and the chapel (presented by Jacques Cœur in 1446), this building is celebrated for the painted glass executed at various times between the twelfth and the seventeenth centuries (some of the windows in the apsidal chapels have modern imitation glass), which has been fully illustrated by MARTIN and CAHIER, *Monographie de la Cathédrale*, fol., Paris, 1841; and for the five stained glass windows from the Sainte Chapelle (destroyed, but a model exists in the town hall) in the very remarkable crypt or subterranean church and its catacombs. It is to be regretted that during the external repairs in 1820-23, the moldings and ornaments which had become decayed were removed and not replaced. Other illustrations of the cathedral are given by SOMMERARD, *Les Arts du Moyen Age*, Album, v, 4, exterior and interior views; the north porch, by GAILHABAUD, *Monuments*, vol. ii; and the portico of the south doorway, which is very remarkable as a specimen of uncommon foliation, is given in the MAGASIN PITTORESQUE, 4to., Paris, 1833, i, 172. *Le Moyen Age Monumental*, plates 6, 206, 271.

The churches of the Virgin and of S. Bonnet, founded respectively in 1157 and 1250, were burnt in 1487, and rebuilt in 1520 and 1510. The latter church is remarkable for its painted glass.

The archiepiscopal palace, an Italian edifice, with gardens designed by Le Notre, was rebuilt (1572-76) after its destruction by fire in 1559: the old *seminaire* near it, now occupied as the artillery barrack; the *hôtel de la préfecture*, occupying the site of the palace of the dukes of Berry; the public library; the museum and *collège*; the *seminaire*; the theatre; and the hospitals, are of less importance than the *caserne de gendarmerie*, known as the house of the professor Jacques Cujas, who acquired it in 1522, being then the *hôtel de Salvi* built in 1515 by Pellevoisin for Duranti Salvi, secretary to the constable de Bourbon, and occupied as an Ursuline convent until its purchase by the municipality. It is built of brick with stone facings round three sides of a quadrangle, and has mullioned windows, projecting

angle turrets, and rich dormers. The screen wall fronting the street has turrets or watch towers with high conical roofs. Still more interesting is the house designed, or at least planned, by Jacques Gendre, also called Jacques de Pigny (1443-53), for the goldsmith Jacques Cœur, which is even now large enough to contain the *mairie*, three law-courts, and the chamber of commerce: it is deemed a model of a mediæval mansion of that date, being much more elaborate than the preceding house, and having the chapel and the exterior in a good state of preservation. The plan, views, and details, are given in GAILHABAUD, *Monuments*, vol. iii; it is also amply illustrated by HAZÉ, *Notices Pittoresques*, 4to., Bourges, 1834, pl. 10-38; and the courtyard is illustrated in SOMMERARD, *Les Arts du Moyen Age*, Atlas, iv, 5; also in CLUTTON, *Remarks, etc., on Domestic Architecture of France*, fol., London, 1853, p. 74. Only inferior to this is the house numbered 3 in the *rue des Vieilles Prisons*, which is now occupied by a convent, and called the house of Louis XI. PERQUIN DE GEMBOUX, *Lettre sur le Premier Propriétaire de la Prétendue Maison de Louis XI à Bourges*, 8vo., Chateauroux, 1842, insists that it originally belonged to one of the family called Chenu l'Allemand, on account of the chestnut fruit placed everywhere on it as an ornament. Its style is that of the Renaissance, as it was rebuilt about the year 1512 by the Lallemand brothers, who were successively mayors of the city; the *salle*, the *grand pièce*, and the rich chapel, 15 feet long by 10 feet wide, are remarkable. A stone house of the fifteenth century, numbered 15 in the *rue des Toiles*, has some curious details in the window dressings; and in the *rue S. Sulpice* are examples of the domestic architecture of the following century. In the *rue du Poirier* and near the *porte S. Michel*, which leads to the *cours de Seraucourt*, is the old portal of the destroyed church of S. Ursin, which dates from 1010, and bears the inscription "Giraudus fecit istas portas". It is chiefly remarkable for a representation of the twelve months of the year; GILBERT, in *Mémoires de la Société Royale des Antiquaires de la France*, new series ii, old xii, 1836, 8vo., 247. It is illustrated in DE JOUFFROY, *Siècles de la Monarchie Française*.

A zinc mine has been recently discovered near Bourges; and the quarries of *Salle le Roi* in the vicinity afford a grey lumachelle marble, somewhat resembling granite, which has been much used in the cathedral. *Builder Journal*, xi, p. 84.

BOURSE, see EXCHANGE.

BOUTEL, see BOLTEL.

BOUVEIL, see BONNUEILL (ESTIENNE DE).

BOVA. A city in the province of Calabria Ultra in the kingdom of Naples. It was almost destroyed by an earthquake in 1783, and was restored by Ferdinand IV. A cathedral under the invocation of the Presentation of the Virgin, several other churches belonging to the convents and monasteries, a *seminario*, and an hospital, are all the public buildings. LEAR, *Journals*, 8vo., London, 1852, p. 37, gives a summary of the opinions as to whether Bova is a remnant of the lower Greek empire, or of an Albanian settlement since 1466. 96.

BOVILLÆ. A town of Latium on the Appian Way. The name is still given to a heap of ruins near Fraticchie, at the foot of the hill of Albano in Italy. Among the ruins are portions of the circus in unusually good preservation, a small theatre, the sanctuary of the Gens Julia, a curious altar of very ancient style, and the ancient walls built of large quadrangular masses of tufa. 28.

BOVINO or BIBINO (the Latin BOVINUM or VIBINUM). A city in the province of Capitanata in the kingdom of Naples. It was made the seat of an episcopal see in the tenth century. The cathedral dedicated to the B. V. Maria Assunta; a parish church; a monastery; and a *seminario*, are the only public buildings of importance. CRAVEN, *Excursions in the Abruzzi*, 8vo., London, 1838, ii, 343. 96.

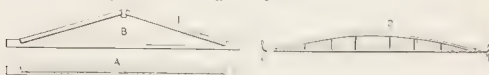
BOW. The native name of a dark coloured wood of Canara. East Indies, used for building purposes. 71.

BOW. The name sometimes given to an archway. The

gates at Edinburgh were called bows, and one at Lincoln is still named the Stone Bow: gate being the northern term for a street.

BOW. A beam of wood or metal with two or more screws which bend a lath of wood or a strip of steel to the outline of a curved surface. A bevel or bow for ascertaining the relation of a curved surface to a straight surface placed at an angle with it, is described by HEBERT, *Engineers and Mechanics' Encyclopedia*, 8vo., London, 1836, i, 165.

BOW AND STRING BEAM. The name given to a beam so trussed that the tendency of the straight part to sag when loaded is counteracted to some extent by the tension upon its two ends, by a bow of wood or metal attached to those extremities; when the bow is downwards the term usually applied is **TRUSSING**, as **TRUSSED GIRDER**, **TRUSSED BEAM**, etc.; when the bow is above the beam, the above term is generally given: thus fig. 1 represents Smart's wooden bow



and string beam or rafter, formed by cutting a beam, A, transversely, as at x, x, and then longitudinally, so that the upper part is not quite separated; the centre is then also cut, and the arms raised as high as may be required, and a key or wedge inserted, as B; *Trans. of the Society of Arts*, etc., 1820, xxxvii. Vol. xlv, 1827, also contains his wrought iron bow and string beam for small openings, fig. 2, formed by welding a piece of iron in an arched shape to a bar of straight iron, and separating the two by uprights; the ends of the bar being turned up or down, as most suitable. Vol. xlii, 1824, gives Richman's mode of raising and stiffening a sagged beam by an iron bow and string applied in small pieces, and wedged up.

BOW AND STRING GIRDER. A wrought iron bow and string girder, lately patented by Mr. G. Nasmyth, and manufactured by J. Walker of London; the principle is that of tension caused by the pressure of a saddle or case resting on, but not fixed to, a bow of T or other iron, and kept in its bent position by an iron or steel tension rod of round, square, or other forms. Figs. 1, 3, 7, and 8.

The rules given for the proper proportions are as follow: the rise of the arch must not be less than $1\frac{1}{2}$ inches per foot, calculated to the centre of the span: thus a 12 feet girder or floor would require a rise of 9 inches. The strength of wrought iron is allowed to bear ten tons to the square inch with safety; these tension bars are only presumed at seven tons. The sectional arc of the bow is to be one-third more than that of the tension bar.

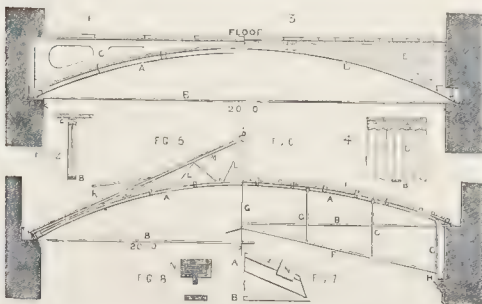


Fig. 1, as applied to a floor: A, bow; n, tension bar or string; c, sandril or case of cast iron. The girders are placed about 6 feet apart.

Fig. 2, section in the middle.

Fig. 3, as applied to a corrugated iron bow, B; the case, E, may be of concrete or brickwork placed at about every 5 feet, by which means hot water pipes can be introduced in the sandrils, or if hollow bricks be used, a free ventilation can be obtained.

Fig. 4, section in the middle.

Fig. 5, as applied to sustaining an iron roof; m, iron rafters supported by iron strutting, n, from the bow, A; k shows the introduction of a skylight. The principals are placed about 6 feet apart.

Fig. 6, as applied to suspension; A and n, bow and chain principal; the chain, r, touching the roof, causes its own weight to act in its favour; c, rods suspending the roof, f, n, gutter. It is adapted for bridges, the roadway being suspended in a like manner.

Figs. 7 and 8 are enlarged elevation and section of saddle (n) for confining the end of the tension bar.

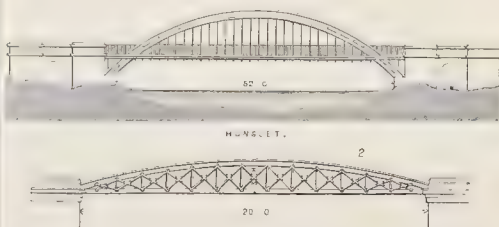
BOW AND STRING BRIDGE, or Bow String, or TENSION BRIDGE. A description of bridge in which the horizontal thrust of the arch, or trussed beam, is resisted by means of a horizontal tie attached as nearly as possible to the chord line of the arch. This description of bridge is useful in positions where headway under the chord line is of importance; and, in consequence of the directions of the thrusts and resistances, it is possible to obtain in the separate ribs by the adoption of this form the nearest practical approach to that of solids of the greatest resistance. Bow string bridges must, therefore, present with less material greater strength than is to be found in parallel girder bridges, whether of cast or of wrought iron. They are, however, exposed to the objection that they require more careful and skilful workmanship, and greater precautions against atmospheric influences.

G. R. B.

A wrought iron tubular bow suspension bridge over the river Ouse in Norfolk, designed by Mr. W. C. Harrison, is given in the *CIVIL ENGINEER Journal*, 1848, xi, p. 1. The bow and string are made of plate iron joined with angle iron; the cross beams, suspending and cross-brace bars, are all of plate iron. The design is for a span of 170 feet, and for two lines of rails, so that there are three bows, each being of half-inch plate iron, 4 feet deep by 3 feet wide; the string, 2 feet 6 inches deep by 3 feet wide.

A wrought iron bow string girder bridge, of somewhat similar construction to the above tubular bridge, has been used by Mr. Joseph Locke, in the Blackwall Extension Railway, over the Commercial Road, 130 feet span. It is illustrated in the *BAUZEITUNG Journal*, ser. 2, pl. 483, 4; and in *Theory, etc., of Bridges*, Suppl. by BURNELL, 8vo., London, 1850, p. 95, pl. 11-15. The experiments made in 1848 on a 120 feet span bridge, as fig. 2, are detailed in the *CIVIL ENGINEER*, xi, p. 300, and *BUILDER, Journals*, vi, p. 452. It was constructed entirely of wrought iron, and consists of an arch of boiler plates and angle iron tied across at the ends by horizontal bars, and the tie-bars connected with the arch by vertical standards, and by a double system of diagonals, with the view of distributing over the whole curve of the arch the action of weights placed on or passing over any point of the bridge. Two hundred and forty tons were applied, producing a deflection of only $3\frac{1}{4}$ inches, that weight being double the greatest load which it would be required to bear. Another is erected over the Regent's Canal on the same line of railway.

The term bow and string suspension principle has been rather improperly applied to a class of bridges in which the roadway, or load, is suspended from an arched beam whose horizontal thrust is resisted by the mass of the piers or abutments; or by the peculiar structure of the beam itself, as in the case of the bent timber bridges, in which the roadway is carried upon, or



near, the chord line. Illustrations of the former description are to be found in the iron bridges erected by Mr. G. Leather,

at Hunslet near Leeds, 1832, 152 feet span; Monk bridge at Leeds, 1827, 112 feet span; COMPANION TO THE ALMANACK for 1833, p. 223; and the suspended aqueduct bridge, 155 feet span, connected with the Aire and Calder navigation at Stanley near Wakefield, 1836-39; illustrated in Nos. 65 and 66 of L'INGENIEUR; each of these three structures has two ribs: on the West London Railway at Wormholt Scrubbs, by Mr. Hosking, 1838, of 70 feet span, with four ribs; SIMMS, *Public Works*, fol., London, 1838; on the London and Birmingham line, over the Regent's Canal at Camden Town, 50 feet span, the roadway being on the chord line; SIMMS, pl. 9 and 10; BREES, *Glossary*, p. 69; a similar one has been used on the Manchester and Leeds road; and another on the North Midland line, at Derby; on the London and Birmingham line also, the Banbury road is carried over the railway, span 64 feet, the road being above the bow, and the ties distended below the chord line,—the distance between the under side of the bow and tie-bar is four feet, which is filled in with studding pieces or saddles, about the same scantling as the spandril filling of a bridge of similar span ought to be on a common construction; on the Birmingham and Gloucester line, at Cheltenham, the bridge has both the rib and the tie at the level of the roadway of cast iron, the lower one being suspended at a distance of 4 feet 3 ins. from the upper, with strong iron rods about the same distance apart: the tie has a rise of 18 inches.

Illustrations of the mode of suspending the roadway from bent timber arches of large span may be found in the works executed upon some of the Norfolk railways. One over the river Ouse at Hilgay, East Anglian railway, by Mr. W. Valentine, 1847, is one of the most important timber bridges recently constructed. It is of the same principle as that over the Regent's Canal above mentioned, but of timber instead of iron. It consists of three ribs of 121 feet 6 inches span, with a total rise of 20 feet, each connected by joisting and by four upper ties near the centre of the ribs; BREES, *Glossary*, p. 75; HASKOLL, *Assist. Engineers' Railway Guide*, 8vo., London, 1848. The timber bridges on the Utica and Syracuse railway have an arch applied to a truss; ISHERWOOD, *Utica, etc., Railway*; HOSKING, *Arch. and Prat. Treatise on Bridge Construction*, pl. 61-67A. BEST TIMBER. LAMINATED RIB. SUSPENSION BRIDGE.

BOW AND STRING DRILL. A DRILL used in a stock which last receives an alternating rotatory motion from a bow worked by hand, the tight string of which is passed round a thimble fixed upon the stock, and rubbed with resin to prevent the string or catgut from slipping. 14.

BOW BAY WINDOW. A name used in familiar language to express a BAY WINDOW (figs. 8-9) generally, whereas it is properly applied only to an elliptically curved window projecting immediately from the face of a wall. It does not appear that the bow window, and the cabinet window (or the square and bow bay window), were much if at all used before the beginning of the present century.

BOW COMPASSES. A pair of compasses of small size, with or without moveable joints. Hair bow compasses have no joint at the knuckle, but the legs, affixed to the handle, are made to approach each other by means of a screw and nut. W. H.

BOWER. A room in houses of the fourteenth, fifteenth, and perhaps of the sixteenth centuries, which was devoted to the exclusive possession of the female sex, and was probably the precursor of the BOUDOIR. CHAUCER, p. 36, enumerates "halles, chambers, kitchens, and bours".

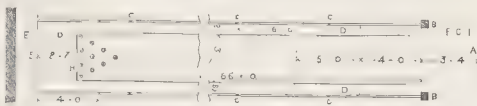
BOWLER. An old spelling for BOULDER.

BOWLING ALLEY. The name given formerly to a close alley in which the game or exercise of bowling at a mark or jack was practised under various rules, as in a bowling green, but with a flat instead of a round bowl.

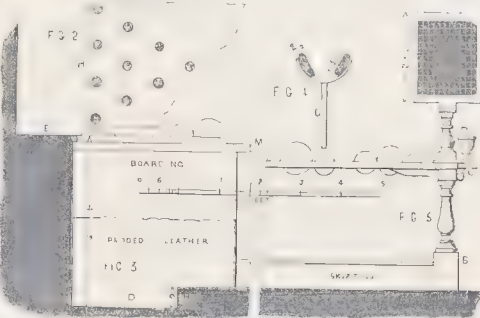
The term AMERICAN BOWLING ALLEY is now applied to a truly level floor about 3 feet in width, consisting of $1\frac{1}{2}$ inch white deal battens, $1\frac{1}{4}$ inches wide, fastened with wooden treails on joists laid upon sleeper-walls: the length of the floor being

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indeterminate, but varying from 50 feet upwards. At one end ten pins are placed, instead of the jack or single mark used at the game of bowls properly so called. On each side of the floor as a trough, laid sloping to the end, to guide the bowls which



run out of the direct width of the mark. Behind the mark is a 6 inch step down to a small floor covered with some stuffing under a mat; the end of this being occupied by an upright piece of sacking or network. A seat placed 4 feet from the ground is needed for the attendant. When there are two or more such alleys together, a division is made by a 2 inch plank standing 8 inches above the trough, and carrying iron standards 5 feet apart, which support two inclined battens, fig. 4, between which the bowls are returned by the attendant to the player. These bars at one end have a trough, fig. 3; at the other end they clip a post carrying a slate, sponge vase, and chalk tray, fig. 5, with a buffer, and a longer trough to hold the bowls. A room with two or more of these alleys is best when lighted from the long sides of a sloping roof. The accommodation of a dressing room, closets, etc., is essential, and a refreshment room with seats for spectators is generally added. Fig. 2 is the plan of the mark enlarged. Fig. 3 is the elevation of the end at the mark, the lower part on each side, and at the end, being filled



in with boarding, and padded with leather or sacking, as marked. Fig. 5 shows an elevation of the post, etc. It is recommended that the first 12 feet of the floor on which the player stands should be of oak.

BOWLING GREEN. One of the accompaniments attached to the private grounds of a residence during the sixteenth, seventeenth, and early part of the eighteenth centuries; one having been ordered to be made in 1732 for the then prince of Wales. It consisted of a square space of about half an acre or more, well drained, sown with grass seeds or covered with smooth turf, and made perfectly level, on which the game of bowls was played with round balls. The sides were occasionally formed of a mound of turf from two to three feet high, to prevent the bowls from running off; on this mound a terrace walk was made. Around the green were convenient and ornamental accessories, as a shrubbery, a pavilion, and sometimes a bath house. CHAMBERS, *Encyc.*, fol., London, 1768, s. v. Bowling, observes that the game or exercise of bowling was "practised either in open places, as bares and bowling greens, or in close bowling alleys", in which last a flat bowl was used.

BOW PEN AND BOW PENCIL. Mathematical instruments for drawing circles, consisting of a pen or a pencil fitted into one leg of a pair of compasses, which can be lengthened by the addition of a bar for the purpose of drawing large circles. The pencil is usually fixed in a holder secured by

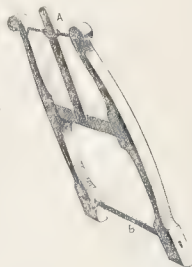
a screw. Small bow pens and pencils are made either with or without joints; and those still smaller are formed similar to bow compasses, being regulated by a screw and nut. These are made of flexible steel; the larger ones being commonly of brass or of electrum.

W. H.

BOWREE (also written **BAORIE**, "a reservoir of water"). The term used in Hindostan for a well with one or more flights of steps down to the water; a well without these steps being called a *kocah*. *Top, Travels in Western India*, 4to., London, 1839, pp. 222, 224, gives an illustration of one in the fort at Puttun, as sketched by Mr. Arthur Malet: "the steps and the galleries have fallen in, and the only part remaining is one side of the well, finely sculptured, the stones of which were probably taken by the Mussulmans from some Hindoo temple; they are covered with figures." But a more picturesque view of so simple a composition is that from Boondee, given by FERGUSON, *Picturesque Illustrations*, fol., London, 1847, pl. 17. The Taj Bowree at Beejapore is one of the subjects of drawings in the collection of the East India Company, and "although neither so large nor so splendid as other specimens that might be selected, its form and details are as elegant as those of the other buildings of the city", and are well worthy of careful examination.

BOW ROOM. The name improperly given to a room which is enlarged on one or more sides by a BAY WINDOW.

BOW SAW. A saw having the cutting part or blade fixed at one extremity of a curved handle, and drawn tight by a screw acting at the other end; it is chiefly used in joinery for cutting thin pieces of wood into curves: but it is now frequently supplanted by a machine which gives a rapid jumping perpendicular movement to a saw which cuts with great facility any contour traced on the wood, the material being moved to the saw.



BOWTEL, or **BOWTELLE**, see **BOITEL**.

BOW WINDOW, see **Bow Bay Window**.

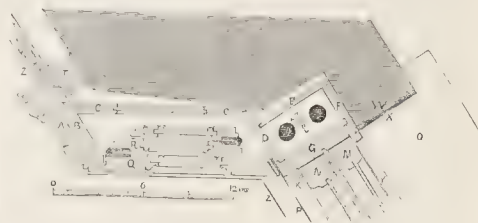
BOX BEAM. A beam constructed of four sheets of wrought iron, generally boiler plate, riveted to as many pieces of angle iron so as to form a long box. It has been deemed by some superior to a PLATE BEAM, or three plates of wrought iron riveted to four pieces of angle iron; as the comparative strength of the two, *weight for weight*, is as 100 to 93. This difference in the resisting power of the two beams arises solely from the better form of the box beam, which contains a larger sectional area, and is consequently stiffer and better calculated to resist lateral strain, in which direction the plate beam generally yields before its other resisting powers of tension and compression can be brought fully into action. Though the box beam is not easily painted on the interior faces, it has perhaps the merit of allowing the insertion of timber as an additional security in case of fire. FAIRBAIRN, *On the Application of Cast and Wrought Iron*, 8vo., London, 1854, p. 73, however, observes that he has invariably given the preference to the plate beam, on account of its simplicity of construction; and that, although inferior in strength to the box beam, it has valuable properties to recommend it.

BOX DRAIN. A drain constructed with upright sides, and with flat stones, slates, tiles, bricks, or even sometimes boards to form the top.

BOX FOR MITRING, see **MITRE BOX**.

BOX, or **BOXING OF A SHUTTER.** The collective name for the pieces of framing to a window opening, marked B, C, D, in the accompanying illustration, in which B is the ground of the architrave, C the back lining, and D the inside lining of the window frame. The same term is applied to the box now usually made for the reception of the shutter, whether

above the sash, as in the case of revolving blind shutters; or



below it, either externally or internally, as in the case of most modern windows with high window-backs. **SHUTTER.**

BOX OF A THEATRE (It. *loggia*; Sp. *aposenito*; Fr. *loge*; Ger. *loge*). The system of arranging the seats round the walls of a theatre in portions called boxes, separated from each other by partitions more or less close, is said to have been first introduced in the *teatro Farnese*, built at Parma about 1618-28, where the boxes form a range of lofty arcades or *loggie* (whence the French term *loges*) connected by balconies. The idea of having *loges à salons* is said to have been first put in execution at the *opéra comique* in Paris about the year 1840; and the same system has been followed at the opera house and at the *théâtre des Italiens* in that city. That is to say, the depth of some of the boxes is divided into two equal portions by a curtain, and the part most removed from the stage becomes "une espèce de petit réduit mystérieusement éclairé, avec divan, glaces et tapis, où les spectateurs peuvent se tenir pendant l'entr'acte et causer dans une sorte d'intimité".

BOX, or **BATH BAYTON BOX**, see **BATH STONE**.

BOX WOOD. The English name of **BUXUS**.

BOYDEN (WILLIAM) was the chief architect to the chapel of the Virgin in the abbey church of S. Albans, which was erected in the abbacy of Hugo de Eversden (1308-26). 2.

BOYER (ANTOINE), surnamed le Bâtisseur, was abbé of S. Ouen at Rouen. The cardinal d'Amboise, during the reign of Louis XII (1498-1515), caused several churches to be built at Rouen; Boyer arranged many important constructions, amongst which was the abbatial residence, demolished in 1817. AIGARD, *Patria*, 8vo., Paris, 1847, p. 2162.

BOYFIELD (JOHN), abbot of Gloucester, was supervisor of the works in the time of the two preceding abbots (1337-77), during which period the vault of the choir was executed. DAL- LAWAY, *Discourses*, 8vo., London, 1833, 73, 79, conjectures that the cloisters of the same cathedral were also designed by Boyfield, although executed by his successor. He died in 1381.

BOYLE. A market town in the county of Roscommon in Ireland. It is situated on the river Boyle, and is interesting on account of the ruins of the Cistercian abbey; portions of which show the advanced state of native architecture previous to the Norman conquest of Ireland. The monastery removed to Boyle in 1161, and the building was consecrated in 1218. Dunsleibha O'Hionmainen, who died in 1230, is recorded as the "principal master of the carpenters of the abbey." It was plundered by the English in 1235. The principal part of the nave, chancel, and transepts, are erected in the Romanesque style; the west end alone showing a transition to the First Pointed. The church is 180 feet long from east to west, and 72 feet along the transepts; the nave, having seven arches on each side, is 131 feet 6 inches long and 24 feet 4 inches wide between the pillars; the aisles were the same length, and 9 feet wide; the transepts are 24 feet 8 inches wide; the vaulted chancel is 22 feet 9 inches long by 22 feet 3 inches wide, and has a triplet window with semicircular heads. The transepts have each two small vaulted chapels on the east side; there is a low tower at the intersection of the cruciform plan; the arches under it are 42 feet high. Some remains of the clerestory, aisles, the large cloister court, and other portions, still exist: the nave

is perfect, and the capitals of its pillars are curious for the sculptured figures and animals, which are not grotesque.

The town also possesses a church, four chapels, a court house, a bridewell, a workhouse in the "Old English" style, and a public garden or park. Immediately in the neighbourhood are the islands of Lough Ree, having many ecclesiastical remains of great interest upon them. WELD, *Survey of Roscommon*, 8vo., Dublin, 1832; O'DONAVAN, *Annals by the Four Masters*, 4to., Dublin, 1851.

R. R. H.

BOYLE (RICHARD), EARL OF BURLINGTON AND CORK, was born 25 April 1695, and died 4 December 1753. CAMPBELL, *Vitruvius Britannicus*, iii, 26, states that the *bagnio* or bathing house at Chiswick was lord Burlington's first design, and fixes the date of it at 1717. He also gives, i, 31-32, iii, 22-25, the plan and elevation of Burlington house in Piccadilly, London (built originally for Charles, the father of this lord Burlington, 1697-1703, by Denham and Webb), and states that the front of the house, the connexion of it with the stables, the great gate and street wall, were all designed and executed by himself, and observes that the stables had been previously erected by another architect, which obliged him (Campbell) to make the offices opposite conformable to them: it will be seen that in the above claim there is room for a supposition that the quadrantal colonnades were not by him; the west front, with the decorations of the house, were generally attributed to lord Burlington himself in the time of Sir William Chambers, as shown in that author's *Treatise*, p. 329. The possible claims of Leoni, if not of Kent, seem to have been always overlooked.

Besides his works upon his estate of Lanesborough in Yorkshire, lord Burlington built in 1729 the villa at Chiswick, in imitation of the villa Capra designed by Palladio, and laid out the gardens: this house was altered and the wings added by James Wyatt, for the third duke of Devonshire; NEALE, *Seats*, v, second series; WATTS, *Seats*, pl. 30 and 50. In 1732 the earl was thanked by the corporation of the city of York for the favour of building the assembly rooms in that city, which are given by WOOLFE and GANDON, *Vit. Brit.*, fol., London, 1767, iv, pl. 78-81, and by DRAKE, *Eboracum*, fol., York, 1736 (the first stone was laid 1 March 1731). He is also said to have designed about 1732 lord Harrington's house, afterwards lord Camelford's, at Petersham, except the octagonal buildings at each end, which were added by G. Shepperd; the duke of Richmond's house in Whitehall, which was burnt in 1791; the dormitory at Westminster school, built in 1722; Burlington school in Boyle-street, in 1725; Savile-street, now Savile-row, in 1733; a residence for Henrietta Hobart, countess of Suffolk, now divided into four houses, immediately south of S. Mark's church, on the east side of North Audley-street; and in 1723 the house built for field marshal Wade in Great Burlington-street, illustrated by CAMPBELL, *Vit. Brit.*, iii, 10; "this façade is now in some measure concealed from public view by the new Burlington hotel in Cork-street, and of which it forms a part". MILIZIA, *Lives*, by CRESY, 8vo., London, 1826, ii, 295.

The following buildings are attributed to him: the alteration of a front and decoration of the lower rooms of that part of Leeds castle in Kent which was pulled down in 1822; NEALE, *Seats*, ii, ser. 2; he modernized Northwick near Evesham, the property of lord Northwick (again altered in 1778); the original portion of Tottenham Park near Marlborough in Wiltshire, for the marquis of Aylesbury, as a hunting lodge, but now forming the central building, wings having been added to contain the state rooms; PATTERSON, *Road Book*, 8vo., London, 1822, 116 and 453; NEALE, *Seats*, v, ser. 1. "The King's mews at Charing Cross, pulled down 1831, was 'generally understood to have been lord Burlington's, though Kent has the credit of it'; GWILT editing CHAMBERS, *Civil Architecture*, 8vo., London, 1825, p. 315, who adds, p. 318, 'his friendship and munificence towards Kent were such, that he lodged him in his house whilst living, and in his family vault at Chiswick when dead. Kent's best work is Holkham in Norfolk: he was

much assisted by lord Burlington in his architectural designs, in which whatever is good may be traced to that nobleman's skill and direction": which may be compared with the expressions used by CHAMBERS himself, pp. 349, 363, and 391, where that author observes of Holkham in Norfolk that "Mr. Kent was the designer of this building, although we have it published under another name"; while BRETtingham, *Plans, etc.*, of *Holkham*, fol., London, 1773, ascribes to lord Burlington two of the ceilings therein engraved, and gives to the earls of Leicester and Burlington, assisted by Kent, the credit of the original ideas of the plan and elevations.

Besides repairing, if not nearly rebuilding, the church of S. Paul, Covent-garden, in 1727, and the hall of the Barber-Surgeons' Company in Monkwell-street, because they were productions of Inigo Jones, he purchased a gateway designed by the same artist, which he removed from Beaufort house, Chelsea, to his grounds at Chiswick. He is said to have brought Leoni to England for the purpose of superintending the edition of Palladio that appeared in 1717; the funds for the publication of the designs by Inigo Jones in 1727, edited by Kent, were provided by him; CASTELL's *Villas of the Ancients*, fol., London, 1728, was offered to the public, and the property conceded to the author, through his liberality; and he purchased in Italy for a considerable sum the original drawings by Palladio of the restoration of the Roman *thermae*, and published them as *Fabbriche Antiche disegnate da Andrea Palladio e date in luce da R. conte di Burlington*, fol., London, 1730, of which only a limited number for private distribution were printed: the fine collection of Palladio's drawings now existing at Chiswick was probably formed by him. WALPOLE's *VERTUE's Anecdotes* by DALLAWAY, 8vo., London, 1826, iv, 216; CUNNINGHAM, *Handbook*, 8vo., London, 1851, 2nd edit.

BOYNET (EMMANUEL) designed in 1670 the screen or *jube* in the church of S. Wandrille at Fontenelle in France. It was supported by four marble pillars, with two altars on each side the choir door. LANGLOIS, *Essai sur l'Abbaye de Fontenelle*, Paris, 1827.

BOYTACA (probably MATHEOS), also written BATACA, BATTACA, BAYTAQUA, BOITACA, BOTACA, BOTAQUA, BOUTACA, BOUTAQUA, BOYTAQUA, and BUTACA, and even supposed to be the same as POTASSI. According to some authors he was a Portuguese, but others contend that he was summoned from Italy by John II of Portugal, who made him in 1509 *fidalgos da casa real*. He was first employed on the works at the convent of Jesus at Setubal, of which the first stone was laid in 1490; and in 1498 the king Emmanuel granted him a pension of 8,000 reis. In 1511 he was created *cavalier* in recompense for some military services at Arzilla, to which place he was again sent in 1514, as well as to Alcacer, Tanger, and Ceuta, to measure the works which he had previously designed: for this he received in 1515 a pension of 12,000 reis: his dimension books, signed Boytaca, still remain. In the accounts of expenditure on the monastery at Belem, commenced in 1500, he appears as architect, and was succeeded by Juan de Castilho. He was also engaged at the monastery at Batalha (1499-1519), and designed the church of the Conception, *Conceição velha*, at Lisbon. He died in 1528.

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BOYTEL, see BENTLE.

BOZARDO (NICOLINO) is entered on the list of the architects to the *duomo* at Milan, under the date 21 Nov. 1406. 27.

BOZLLAR (MIGUEL DE), born at S. Miguel de Areno in Spain, is commemorated as having completed the work, in an inscription dated 1245, under one of the principal arches in the "old work", and at the top of the sacristy of the cathedral of Santiago, in the province of Galicia in Spain. 66.

BRABANT (THEODORIC or THIERRI DE) finished in 1262 the church of the Cistercian monastery of Notre Dame des Dunes, near Bruges, of which he was the thirteenth abbot. He resigned in 1265. SANDERUS, *Flandria Illustrata*, fol., Cologne, 1644, i, 250.

BRACCIANO. A town in the Papal States in Italy, celebrated for a baronial castle, erected about 1485 by the Orsini family on a rocky eminence above the lago di Bracciano; it is considered to be the finest feudal edifice in Italy, and still confers the ancient privileges of a fief. The effect of the volcanic black stone with which it was built is increased by the large size of the outworks. The battlemented parapets, the machicolations, and the four lofty towers of the main building, are in perfect condition; while much of the original furniture in the style of the early part of the sixteenth century, still exists. *Illustrations, STAIRCASE, plate xi.* W. H. 28.

BRACCINI (NICCOLO), sometimes called **NICOLO DE' PERICOLI**, but more commonly **IL TRIBOLO**, was born in 1500 according to **VASARI**. He was apprenticed to Nanni Unghero, and afterwards to Jacopo (Tatti) Sansovino. Having commenced life as a sculptor, he was engaged upon the aqueducts and decorations of the gardens of the villa di Castello, near Florence, when he received the commission, in **VASARI's** words, "to build a bridge over the Mugnone, at a short distance without the gate of S. Gallo, where that river crosses the high road which leads to Bologna; and the arch of this bridge, seeing that the river crosses in a diagonal line, Tribolo constructed in a similar direction, which was then a new thing, and was much commended; the masonry of the stone arch was more particularly praised, being all worked in pieces, each piece having the proper degree of inclination from the square in every direction." He was then appointed superintendent of the *Capitani di Parte* and the commission of the Roads and Rivers, which placed the repairs of bridges under his direction. About 1550 he gave designs for finishing the Pitti palace, commenced by Brunellesco, and for the Boboli gardens, in both of which works he was succeeded by Buontalenti. **VASARI** states that he died 7 September 1550, at the age of sixty-five years; **GAYE, Carteggio**, 8vo., Firenze, 1839, ii, 380, says 26 August.

BRACCIO. An Italian measure of length, which differs in the leading cities of Italy, as shown in the following table.

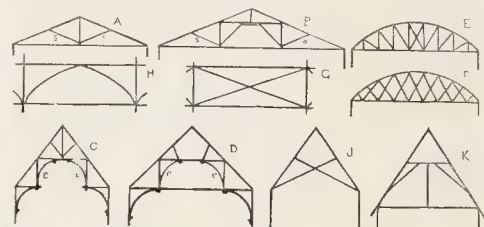
	Cat. 16	11. 10.	Varese	Seagrams	Waterston.
	Eng. feet	Eng. feet	Eng. feet	Eng. feet	Eng. feet
Ancona .....	..	..	16.00	16.00	2.1108
Bologna .....	..	..	16.00	16.00	..
B. di S. Maria .....	..	..	16.00	16.00	1.9750
B. di S. Maria	2.012	..	16.00	16.00	2.0853
Brescia .....	..	..	16.00	16.00	..
Florence .....	..	..	16.00	16.00	..
" .....	..	..	16.00	16.00	..
" .....	..	..	16.00	16.00	..
"	1.600	..	16.00	16.00	1.9149
B. di S. Maria .....	..	..	16.00	16.00	1.7084
Genoa .....	..	..	16.00	16.00	1.8008
Lecce .....	..	1.958	16.00	16.00	..
B. di S. Maria .....	..	..	16.00	16.00	1.8950
B. di S. Maria .....	..	..	16.00	16.00	1.8953
Mantua	2.002	1.521	16.00	16.00	17.40
Milan	1.725	..	16.00	16.00	..
Modena .....	..	2.061	16.00	16.00	2.0258
Palma	2.042	1.860	16.00	16.00	20.16
B. di S. Maria .....	..	..	16.00	16.00	1.6500
B. di S. Maria .....	..	..	16.00	16.00	2.1134
B. di S. Maria .....	..	..	16.00	16.00	1.7783
Padua .....	..	1.740	16.00	16.00	..
Placenza	2.211	..	16.00	16.00	..
Ravenna .....	..	..	16.00	16.00	1.7375
Rome .....	..	..	16.00	16.00	..
B. di S. Maria	2.561	..	16.00	16.00	..
B. di S. Maria	2.806	..	16.00	16.00	..
B. di S. Maria .....	..	..	16.00	16.00	..
Siena .....	..	..	16.00	16.00	21.84
Torino .....	..	2.000	16.00	16.00	2.0039
Treviso .....	..	2.100	16.00	16.00	2.2166
Trieste	1.781	1.656	16.00	16.00	..
Venice .....	..	..	16.00	16.00	..
B. di S. Maria	1.18	..	16.00	16.00	2.0666
B. di S. Maria	2.10	..	16.00	16.00	2.2166

It corresponds to the French *aune*, being 1.20 of a mètre, or 3.937 English feet: the English ell is 3 feet 9 inches. At Pistoja is a braccio in bronze placed on the palazzo Comunale; and at Florence one is seen on a wall near the gate of the palazzo del Bargello.

The French *pied de roi* is usually taken at 1.066 English feet. **Q. DE QUINCY, Dictionnaire**; **GWILT, Encyc.**; **WATERSTON, Manual**, 8vo., Edinburgh, 1840.

BRACE. A tool formed of a piece of iron with a small hole, formerly used instead of the top of a stock, with which it is now often confounded, as in the common expression "a brace and bit". It was tied to the arm (*bras*), from which the name was derived. It is often used by smiths, but seldom by joiners. **WIMBLE.** A. A.

BRACE. A piece of timber so disposed in a truss or other framing as to counteract any tendency in the various parts to alter their relative position *horizontally*; a strut being so disposed as to counteract this tendency *vertically*. An *angle brace* is more properly called an *ANGLE TIE*. The terms *brace* and *strut* were for a long time used indifferently until the real office of the different parts of framing was considered: even **TREDGOLD, Elementary Principles of Carpentry**, 4to., London, 1828, uses the expression "braces or struts" in speaking of the frames of king-post and queen-post roofs, as *s* in A and B. The term **BRACE** is also applied to the brackets or struts under hammer-beams, as in the examples c and d; and even to timbers in similar positions, as the curved struts, *e*, supplying arcuated forms of decoration as well as of support in mediæval carpentry: the upper ones, *e e*, in the examples c and d, are,

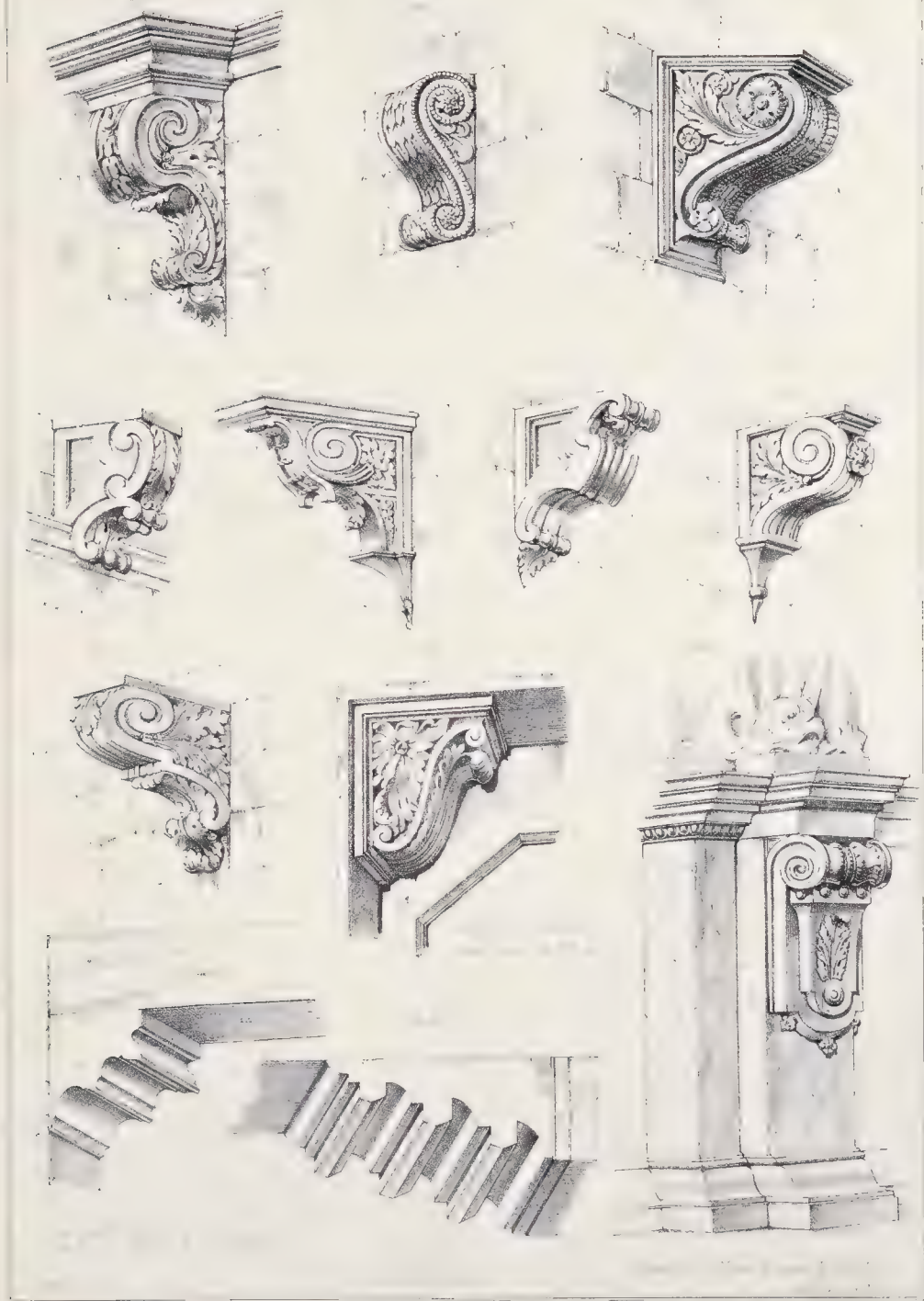


however, braces in some degree as well as struts; like those in the examples *e* and *f*, which are both posts and ties, and are indifferently called braces or struts in iron work.

In roofs of the mediæval period having ceilings of boards fastened to rafters, "purlin-braces" are usually found, which are introduced in two ways; that shown in the example *g* being truly *rafter-bracing*, as that in *h* is also *purlin-strutting*; and in still older roofs *principal braces* or *tie-braces* are found, as in the example marked *j*, and *collar-beam braces* or *collar-braces*, as in that marked *k*. These terms have not only been improperly adopted in descriptions of the modern system of strutting the beams of roofs, but the word *brace* has been used instead of *strut* in relation to partitions. In the case marked *o*



the inclined pieces or cross-braces are called a *S. Andrew's cross*, and in French a *croix de S. André*; and in the three previous modes the corresponding timbers are called in the same language *guyettes*; but the dotted lines in the example *z* are more properly struts, as are all the shorter pieces in that marked *r*. Braces were probably originally placed on one or both sides *outside* the partition, or else solely occupied the middle of it, instead of the thickness of the framing, like the recent practice in "framed and braced" partitions, and the present custom in "trussed" partitions. Such inclined pieces in carpentry as *e* and *f* are struts when within the thickness of the framing, but braces when outside it. **BOARD AND BRACE.**





Bow, *A Treatise on Bracing, with its application to Bridges and other Structures of Wood and Iron*, 8vo., Edinburgh, 1851.

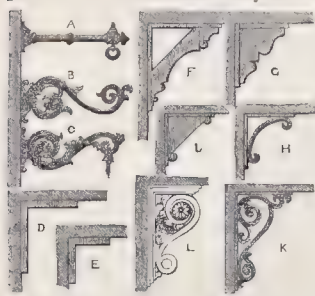
BRACHELIEU (DON LEANDRE), a native of France, succeeded Marchand in 1735 as *maestro mayor* of the works necessary to the completion, especially in the principal front, of the palace at Aranjuez in Spain, which he finished externally in 1739. He died before 1744. 66.

BRACHETTI (FRA GIOVANNI), born at Campi, and frequently called FRA GIOVANNI DA CAMPI, was probably a pupil of Fra Albertino Mazzanti, or of Arnolfo di Cambio. On the death of the former in 1319, Brachetti, who had two years previously taken the Dominican habit, continued the works at the church of Sta. Maria Novella at Florence, commenced by Fra Sisto and Fra Ristoro. His pupil Fra Jacopo Talenti was associated at some time with him in the work. They erected the nave; the western aisle; the principal chapel; the one next to it, di S. Luca or the Gondi; and two greater chapels of the Rucellai, south of the south transept, and in the north that of the Strozzi family, dedicated to S. Thomas Aquinas: the three lateral chapels of the great altar appear by their architecture to be of a later period. The erection in 1320 of the cloister il Verde, and of the ancient chapter house, now the capella de' Spagnuoli, is also ascribed by MARCHESI, *Lives*, 8vo., Dublin, 1852, i, 94, on apparently good grounds, to Brachetti, who is supposed by the same author, p. 98, to have designed in 1319 the edifice which was built adjacent to his monastery, as a lodging for the officers of the Republic and of distinguished strangers, and to have had in 1321 the charge of the restorations and buildings undertaken by the government. MARCHESI also cites proofs that Brachetti was the principal and only architect of the five-arched bridge at Florence called the Carraja, rebuilt in 1334, completed in 1336; of which two arches and their piers were restored by Ammannato after the flood in 1557. No one that has seen his works will deny him a distinguished place amongst the great architects of the fourteenth century. He died in 1339.

BRACHOWITZ or BRACHAWITZ (PETER VON) was *baumeister* of the tower of the church of S. Stephen at Vienna, 1404-29. 26, 92.

BRACKET. This word, which is said to be derived from the Latin *brachium*, an arm, implies in metal or timber work that which CORBEL means in stone, viz. a means used for supporting by *levrage* from the face of a wall, as A, B, and C, any mass which is totally independent of the wall against which it is thus attached; and in decoration the term is applied to those details which appear to perform this office, whether they do so in reality or not. H. B. G.

JUNUS, *Nomenclator*, 8vo., London, 1585, p. 210, mentions "pieces of timber in building called braggors or shouldering pieces . . . in mason's worke they be called corbelles." CHAM-



BERS, *Encyc. s. v.*, says that bracket was "written braget, a stay in form of a knee or shoulder."

When a bracket is of any considerable depth in proportion to its projection, as D and E, it is called a 'stay', or 'angle-stay'; but the metal supports of this kind which are frequently

used to carry shelves, are also called brackets.

When a plain or ornamental strut, with open or solid spandrels, as F, G, H, and J, is applied to a bracket, the whole is often improperly called a TRUSS, which term is equally incorrectly applied to the examples K and L, commonly used to support busts, vases, and similar objects of decoration.

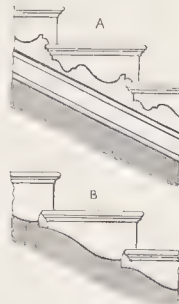
ARCH. PUB. SOC.

VIOLLET LE DUC, *Dict. s. v. boutique*, gives examples of the extensive use of brackets in a solid form in mediæval dwellings; *Illustrations*, FAÇADE, pl. 32; BRACKET, pl. 103; and CORBEL, pl. 5, 31, and 53, which plates also show the application of open and other brackets in situations corresponding to modillions in cornices of the classic orders; some of which examples may be compared with the vignette given by VIOLLET LE DUC, s. v. *Autant*.

The difference between a BLOCK, a CANTILEVER, a CONSOLE, a MODILLION, a MUTULE, and a TASSEL, depends chiefly upon the place in which each of these varieties of the bracket or corbel is employed.

BRACKETING. Pieces of wood, fixed at intervals to supports, and cut to the shape necessary to receive the main portions of wooden cornices, and other projections, or the laths of plaster cornices, and to support the treads of a staircase; similar preparations when used for domes or vaults, are called 'ribs'. Bracketing is constantly fixed against flues, a practice which is exceedingly dangerous, but for which no remedy appears to have been adopted. The act and the method of fixing the pieces of wood or brackets are also called bracketing.

The brackets for stairs are frequently cast in metal to resemble the side of a bracket or corbel. The term is also applied to a decoration of the string-boards next to the well hole of a wooden staircase, where the return of the riser is covered either by a *cut bracket*, which is plain on the face, A; or by a *wrought or fancy bracket*, which is either carved in wood, or modelled in stucco: this system appears to have been copied from the more expensive form, seen in geometrical staircases of stone, B.



BRAD. A nail originally made without, but now always having, a beak or bill projecting from one of its quarters or sides. It is oblong in section, and may be driven into wood-work by a punch so that the wood may be planed or primed. NEVE, *Dictionary*, 1736, enumerates batten, joiners', flooring, and bill brads or quarter brads as then in use, and gives their sizes and weights. The terms 'twopenny', 'threepenny', etc., which are still in use, refer to the retail prices paid a hundred years since; thus—

Name	2d.	3d.	4d.	6d.	10d.	and 20d. per 100.
Length in inches	1	1½	2	2½	2½	2½ 8½ 9½
Weight per 1000 of 1200 ..	14 oz.	1½ lb.	2½ lb.	5 lb.	14½ lb.	17 lb. 20 lb. 22 lb.
They now cost about	10d.	17d.				27d. per 1000 wholesale.

At present wrought brads are called by the ironmongers *battens*, of which—

Common battens (rank with glazier's spikes and bed studs, and are named by weight)	1 1/2	1 1/2	2	2 1/2	3	4	5	6 lbs. per 1000.				
Fine battens or joiners' brads are	1 1/2	1 1/2	1 1/2	1 1/2	2	2 1/2	2 1/2	3 inches long.				
they weigh about	4	6	8	12	14	20 oz.	2	3	4	5	6	8 lbs. per 1000.
Coach brads are finer, thinner, and slightly more expensive.												
Extra fine battens are	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2 1/2	2 1/2	2 1/2	3 inches long.		
they weigh about	3	6	12 oz.	1	1 1/2	2	3	4	5	6	7 lbs. per 1000.	
Double extra fine battens are still more expensive.												
Flooring brads are							1 1/2	2	2 1/2	2 1/2	3 inches long.	
they weigh about							7	8	10	12	16	20 lbs. per 1000.
Billed brads, the same but stouter, weighing							7	8	10	12	16	24 lbs. per 1000.
Both kinds being used for floors							2	2	1	1	1 1/2	1 1/2 inches thick.

Cut brads are of parallel thickness and blunt-pointed, being cut from sheet iron; a more brittle sort is cut from hoop iron for cheapness.

Joiners' brads are . . . 1½ 2 2½ 3 1½ 1½ 1½ 2 2½ inches long. Patent flooring brads . . . 1½ 2 2½ 2½ 3 inches long.

BRADAWL. A small tool of different sizes, used by joiners and other mechanics for boring wood. It consists of a piece of round iron or steel fixed in a handle, and sharpened with a

double basil into a cutting end; and is sometimes used as a screw-driver for very small screws.

BRADLEY (THOMAS) designed Crownest House, near Halifax in Yorkshire, for William Walker, Esq., which was commenced in 1788, finished before 1801, and is illustrated by RICHARDSON, *Vitr. Britt.*, fol., London, 1802, pl. 64, 65.

BRADSHAW (LAURENCE) is mentioned in one of the office books of accounts of the reign of Henry VIII, as the Crown surveyor, with an annual payment of £36:10:0, a fee of two shillings per diem, and a clerk. VERTUE, *Anecdotes*, 8vo., London, 1826, i, 217.

BRAGA (the Latin BRACARA AUGUSTA). The capital of the province of Entre Douro e Minho in Portugal. Remains of a Roman aqueduct, theatre, and amphitheatre, existed until 1835. The fountains in the *plazas*; the curious old houses; the cathedral, under the invocation of the Assumption of the Virgin; the sumptuous quadrangular archiepiscopal palace; and the large *seminario*, are the chief objects of notice in the town, which also contains six parish churches, and about as many convents and monasteries, a college, an hospital, and an almshouse. VIVIAN, *Scenery of Portugal*, etc., fol., London, 1839, pl. 23, illustrates the fountains erected in 1723 in front of the palace. The sanctuary "do Monte", a little to the east of the city, is the most sumptuous in the country.

BRAGANÇA or BRAGANZA. A city, and since 1770 the seat of a bishopric, in the province of Tras-os-Montes in Portugal. It was formerly fortified, but the walls and castle are almost in ruins. The parish church, now the cathedral, under the invocation of the Assumption of the Virgin, a parish church, a convent and two monasteries, a college, an episcopal palace, two hospitals, three *plazas*, and a race course, are the chief features of the town. 14. 50.

BRAGANCA NOVA, in Portugal, see AVEIRO.

BRAGERIO (BERTOLINO) and Giacomo di Camperio are recorded as *magister murii*, *magister murarie*, of the transepts added to the cathedral at Cremona, in order to change the plan from that of a basilica into the form of a Latin cross; the work was executed in 1388, according to an inscription given *s. n.* by GRASSELLI, *Abecedario*, 12mo., Milan, 1827, correcting VAIRANTI, who gives the date as 1388.

BRAGGER, see BRACKET.

BRAHE (TYCHO). A celebrated astronomer, was born 14 December 1546 at Knudslorp, near Helsingborg in Denmark. He designed the observatory built for the burgomaster Paul Hainzell at Augsburg (1569-70); the observatory and the residence in the Danish island of Huen (1576), illustrated by Gassendi; and the manor house called Engelsholm near Vide; this last is a building in a Pointed style, with four angle turrets surmounted by spire roofs: one of the rooms extends the whole length of the building, and is floored with boards each 48 feet in length, cut out of the masts of vessels wrecked on the neighbouring coast of Jutland. He died at Prague 24 October 1601. 14. 28. 46.

BRADMA (TEMPLES TO). Temples dedicated to Brahma do not now seem to occur in any part of India. A particular worship is however paid to him at Pushkara or Pokur in Ajmeer, and on the Brahmapurta Chat at Bithore in the Doonab. WILSON, *Asiatic Researches*, 4to., London, 1828, xvi.

BRAMANTE (DONATO or DONNINO), see LAZZARI (DONATO).

BRAMANTINO (IL), see SUARDI (BARTOLOMEO).

BRAMBANA, BRAMBANAN, BRANBANAN, or PRAMBANAN. The name given to the ruins still existing in the district of Mataram, nearly in the centre of the island of Java. The many groups of temples here to be traced have been separately named the *Chandi* (temple) *Kobon Dalam*; the *Chandi Loro Jonggran*; and the *Chandi Sewu*, or the thousand temples. The latter, which is the most perfect and considerable, really consists of 296 apartments, and occupies an area 540 feet long and 510 feet broad. It consists of four squares of small temples, enclosing

in the centre a larger one, the height of which is 75 feet; each of the small temples being only 18 feet high to the top of the dome. The builders of Brambana possessed the art of turning the elliptical arch and vault: CRAWFORD, *History*, 8vo., Edinburgh, 1820, pp. 196-200. The date of the earliest works is assumed to be about 1188, and that of the latest 1218. A long description of them and of the neighbouring buildings is given by MACKENZIE in the *Asiatic Journal*, 8vo., London, 1816, ii, 15, 132, 236, 350, which is probably the same as that in *Transactions of the BATAVIAN SOCIETY*, vii. About a mile from the above ruins are others called the *Chandi Kali Sari*, which are supposed not to have been a temple but a residence, like those of a palace half a mile distant, near the *Chandi Kali Bening*. All these buildings are fully described by RAFFLES, *History of Java*, 4to., London, 1817, ii, 7-29 (who also gives views and restorations of the large temple and one of the small ones at *Chandi Sewu*), extracted from the report of Capt. G. Baker, which was to have been published by Raffles in 1817, and probably formed part of the second edition of his work.

BRAMHAM MOOR STONE. A name locally given to Roche Abbey stone. POULSON, *Beverlac*, 4to., London, 1829, p. 679.

BRAMLEY FALL STONE. A sandstone of the millstone grit formation quarried in the township of Bramley, about three miles from Leeds in Yorkshire. The original quarry was closed 1839-40, because the depth of soil, etc., to be removed before arriving at the stone entailed too great an expense, but there are two other quarries at a short distance from the above, one of which is worked. The colour, although of a light ferruginous brown when fresh from the quarry, becomes nearly and sometimes quite white when thoroughly dry. It is composed of quartz grains often coarse, and decomposed felspar with argillo-siliceous cement. Mica is but rarely found in it, but small ferruginous spots are disseminated throughout the mass. A cubic foot weighs about 142 pounds. This stone was used for the Wellington bridge at Leeds, 1817-19, for the piers of Southwark bridge at London, 1819, both designed by John Rennie; and for the entrance gateway and lodge of the terminus at Euston-square, London, designed by Mr. Hardwick, R.A. It was also much used for dock walls, copings, and similar purposes. REPORT, ETC., OF THE COMMISSION, etc., 2nd edit., 4to., London, 1845. W. R. C.

DERBYSHIRE BRAMLEY FALL STONE was the name given to stones similar to the above, extensively introduced into the London market to supply the place of the Yorkshire stone, and was so called because great part came from near Bakewell in Derbyshire.

BRAN. A local term given to the rag stone which is sometimes found *under* block stone, in sandstone quarries at Leeds in Yorkshire, and being more compact than common rag (which is obtained from the strata *overlying* the block stone), is used for foundations where the top bed requires to be worked level, as in engine beds, etc.: thus 'bran' takes an intermediate position in value between rag stone and delph or York landings. W. R. C.

BRANCA (GIOVANNI) of Pesaro, born 1571, built some good edifices. Of his *Manuale di Architettura* there are several editions; and in *Le Machine*, 4to., Rome, 1629, he calls himself architect to the Sta. Casa at Loreto. 3.

BRANCHED WORK. Groined vaulting: the ribs being called in French *branches*. 1. 5.

BRANCHIDÆ (Gr. *βράχιδαι*). The priests of the temple to Apollo at DIDUMA in Asia Minor: they founded a town in Sogdiana, which was destroyed by Alexander of Macedon. By custom the temple was said by the ancients to be "at the Branchidæ" (or as the French would say *chez les Branchides*); and the moderns improperly speak of the temple to Apollo of Diduma (Apollo Didymæus) at Branchidæ, as if this last were the name of a place. 23.

BRAND (HANS) was engaged in 1485 upon the *dom* at Dantzic. 92.

BRANDENBURG. The capital of the circle of West Havelland in Prussia. Walls with nine gates enclose the city, which consists of an "old" and a "new" town, separated by the river Havel, in which there is an intermediate town called the Burg, on an artificial island, the houses being built on piles, and the roadways formed on a soling of hurdles laid upon framed timbers. On this island is the castle, the riding school, and the cathedral, dedicated to S. Peter, with a crypt (containing the old episcopal throne) probably belonging to the tenth, a nave to the twelfth, and the remainder to the beginning of the fourteenth century: it was restored by Schinkel in 1836. The church contains three tombs of the episcopal markgraves, and a model of the Marienkirche, a building of the twelfth century, destroyed in 1722. The cathedral is represented in the *ILLUSTRATED LONDON NEWS Journal*, 1848, xiii, 372. There are seven other churches, of which that dedicated to S. Gothard, built in 1324, has a font of earlier date; and that dedicated to S. Catherine, a metal font of the date of 1440, and some curious monuments: the church is of brick, and dates from 1401. **KALENBACH**, *Baukunst*, Munich, 1847, illustrates, under the date 1405, the Marienkirche, a good example of the use of red and black bricks. The *rath-haus*, a fine building in a Pointed style, twelve public schools, and five or six hospitals are the only other public buildings. W. H.

BRANDENBURG (PAUL VON) built in 1484 the spire (*thurm Spitze*) of the Katherinenkirche at Brandenburg; and in 1488 the monastery (*Kloster*) at Neuruppin. 92.

BRANDINI (BACCIO DEI), the name by which BACCIO BANDINELLO was originally known. 73.

BRAND IRON, improperly called BRAND. The horizontal piece of metal of an ANDIRON or fire-dog upon which the burning wood is supported.

BRANDISHING, see BRATISHING.

BRANDRITH. A fence or railing round the mouth of a well. 1. 4.

BRANKURSINE. The English name for the ACANTHUS MOLLIS.

BRANTEY. The local name of a light brown coloured, weak and inferior wood of Penang, used for building purposes. 71.

BRAOES or **BRUSE** (EGIDIUS or GILES DE), son of William lord of Brecknock, consecrated bishop of Hereford 24 Sept. 1200, is considered to have built the great central tower of that cathedral. An effigy in the south aisle, holding the model of a church in one hand, is said to commemorate him and the event. He died 17 November 1215. **BRITTON**, *Hereford*, 4to., London, 1835, p. 13.

BRARD'S DISINTEGRATING PROCESS. A method of ascertaining readily the relative powers of stones to resist the effects of frost. It was employed by the commissioners appointed to examine the stones for the new Houses of Parliament, and may with perhaps contradictory results be usefully employed in like cases. The specimen stones being reduced to cubes of exactly equal size, and boiled in a saturated solution of glauber salts (sulphate of soda), are then suspended by strings, each being completely isolated, over a vessel full of the solution in which they have been boiled, any fragments of stone which may have become detached during boiling having been previously removed. In twenty-four hours the cubes will be found to be covered with small crystals of the salt, which are to be removed by plunging the cubes into the solution over which they are suspended, the process being repeated as often as the crystals appear. This should be continued for four days; and at the end of that time the weight of the particles of stone found in the solution, *i. e.* the amount of disintegration thus artificially produced, is assumed to be a criterion of the powers of resistance to frost of the stones experimented upon. The merits of the process are discussed *s. v.* ATMOSPHERIC INFLUENCE. G. R. B.

BRASS (It. *ottone*; Sp. *alaton*; Fr. *laiton*; Ger. *messing*). A class of mixed metals much employed in the arts, on account

of their hardness and resistance to the action of the atmosphere. They are obtained by the mixture of copper and zinc in variable proportions, according to the uses to which it is to be applied.

To avoid the ordinary improper use of the words brass and bronze, the first name will be exclusively applied in the following description to a composition of copper and zinc; and the mixture of copper and tin will be referred to BRONZE.

The alloys of copper and zinc differ materially in composition, according to the uses to which it is desired to apply them; *i. e.* to the degrees of hardness or of malleability required, but all possess general properties, of being yellow in colour, susceptible of receiving a high polish, and only superficially acted upon by the air. Brass is principally used for making pins, the chords of musical instruments, and elastic webbing in the form of wire; in the form of sheet brass for boiler tubes and the covering of ships' bottoms, and for stamped architectural decorations; as solid brass it is largely used in the construction of certain parts of machinery, and in architectural ornamental castings, furniture, gas fittings, etc. When cold, most of the alloys are malleable and ductile, and may be beaten into thin leaves called *Dutch metal*, or drawn into thin wire, but at a high temperature they are brittle; brass wire work in any damp place, especially if it should also be warm, as a greenhouse, blackens and falls to pieces.

DUMAS, *Chimie Appliquée aux Arts*, Paris, 1828-46, ii, p. 56, states that Margraff obtained the following table from actual experiments on various mixtures of copper and zinc, and he calls attention to a singular phenomenon which may be observed in all of them; namely, that the density of the mixture is slightly greater than that deducible from the mean of the gravities of the ingredients.

In Weight.		Quality of resulting Alloy.
Parts of Copper.	Parts of Zinc.	
100	100	Hard, brittle, yellow colour, and of a granular fracture.
100	90	Very similar to last.
100	80	Hard, but yields to file, slightly malleable, yellow colour, granular fracture.
100	75	Softer, malleable, yellow, smooth fracture.
100	70	Soft, malleable, yellow, shiny fracture.
100	60	Soft, malleable, beautiful yellow colour.
100	50	As last, but of a brighter yellow.
100	40	As last, but of a golden colour.
100	30	As last, but softer, more malleable, and a finer colour.

As zinc volatilizes at a lower degree of temperature than copper, there is a natural maximum limit to the proportions in which it can be introduced, and **DUMAS** states that this maximum is attained when the zinc and copper are equal in weight; or, in chemical equivalents, when two atoms of copper are mixed with one of zinc. It also appears that brass becomes malleable when it is obtained from a mixture of four parts of copper with one of zinc; and that it assumes a golden colour when it is obtained from a mixture of eight parts of copper with one of zinc. The best description of boiler tubes is composed of one part of zinc and nine of copper.

Brass appears to have been made in Germany for several centuries before the manufacture was introduced into England in 1649. Formerly brass was obtained by melting together the pure oxide of copper with an ore of zinc called calamine, an impure carbonate of that metal; and this process is still retained in many places, although the immediate use of both of the pure metallic oxides is becoming more general. The finest sorts of brass are melted twice, however the metals be mixed; and in such cases the first runnings are cast into ingots. When brass is to be used for making pins or other wires, or as sheet brass, it is cast into thin plates between stones, and the plates are subsequently rolled, or wire-drawn.

The different kinds of brass most frequently met with are: 1. Mosaic gold, composed of sixty-five parts of copper to thirty-five parts of zinc. 2. Bath metal, seventy-eight parts of copper to twenty-two of zinc. 3. Pinchbeck, seventy-six parts of copper to twenty-four of zinc, and 4. Prince Rupert's metal,

seventy-five of copper to twenty-five of zinc. Manheim gold is composed of seven parts of copper, three of old brass, and one and a half of tin. BRAZING.

The expression *brass gun* is universally but incorrectly employed, for guns are formed of an alloy of copper and tin. Mechanical engineers call the particular alloy used by themselves and gunfounders, by the additional name of GUN METAL, instead of the more correct name of bronze. *Æs. ORICHALCOS.* ATMOSPHERIC INFLUENCE. LATTEN. G. R. B.

BRASS (MONUMENTAL), see SEPULCHRAL BRASSES.

BRATISHING. A term adopted to express an ornamental crest, by several authors, especially by PUGIN, *Treatise on Chancel Screens*, 4to., London, 1851. The authority for the word, and its orthography, are doubtful. *Brandishing* appears in one copy of a manuscript which was printed by DAVIES, *Ancient Rites*, etc., 12mo., London, 1672; in the same place where *brattishing* occurs in a second edition by HUNTER, *Durham Cathedral*, 12mo., Durham, 1733; both are omitted in the passage given as original by the SURTEES SOCIETY, *A Description or brief Declaration of all the Ancient Monuments*, 8vo., London, 1842. The word is found under the forms *bretasyng* and *bretysyng*, in manuscripts cited in the GLOSSARY, but with the Latin translation *propugnaculum*. BRETESS.

BRATTACUS. The form in which BATRACHOS is frequently but improperly written.

BRATICE. In some mines a single large ventilating shaft is divided into two channels by a partition of iron plate or other fit material called a brattice, so as to make it answer the purpose of two smaller ones, *i. e.* an up-cast and a down-cast shaft; ARNOTT, reported in *Building Chronicle*, 1854, p. 67. Mining engineers use this term to express the reverse currents often produced in the two different sides of one shaft, without any partition between them; it is called a *natural brattice*. T. H. L.

BRAY (SALOMON DE) was born in 1597 at Haarlem in Holland, where the new church was built from his designs in 1647. His son, Dirk de Bray, published in 1667, after the death of the father in 1664, a portrait of him, accompanied by *Bedenkningen over het uitleggen en vergrooten der stad Haarlem*. 24.

BRAZING. The act of joining two pieces of metal by means of brass solder melted between them. The best solder is made of 9 parts of brass to 1 of tin, but of 66 of silver to 33 of brass for the precious metals; hard solder is formed of 2 parts of common brass, two-thirds of a part of zinc, and one-third of a part of tin. The method of soldering among smiths, etc., is by heating the two pieces of iron when hot one over the other; this is properly called WELDING. G. R. B.

BRAZO. One of the standard Spanish measures, also called the *estada* and *toesa*. It contains six Burgos feet, and is equal to 66·768, the French *toise de roi* to 76·750, and the Portuguese *braça* to 86·200 English inches, according to WATERSTON, *Manual*, 8vo., Edinburgh, 1840.

BREAD ROOM. A room fitted with shelves and bins to contain flour and loaves, biscuits and confectionery. During the mediæval period it was a department of the BUTTERY. In large houses the shelves and their standards are made of stone, slate, or marble, and the wall is either lined with similar materials or with tiles. In smaller houses, however, clean woodwork, easily separated for washing, is preferred for the sake of economy. Broad open laths of wood are best for the loaves, as they admit of the air circulating under and around them.

BREADTH. The term as applied to a plane superficies implies the shortest measurement between two opposite sides.

BREADTH OF COMPOSITION implies that degree of unity, regularity, and proportion, which without interfering with the proper balance of parts, the requisite concentration of effect, or the skilful variety so essential to interest, enables the eye to take in at one glance, and the intellect to comprehend in one idea, the whole mass or totality of a composition, by avoiding the distraction arising from the too great prominence of subordinate

parts, or the obtrusion beyond judicious limits of points of minor interest.

BREADTH OF EFFECT is one of the highest qualities of art in any department. It implies that perfect mastery of the resources of composition, combined with consummate judgment in their application, which is the especial characteristic of the great artists; it exhibits that power of casting in one mould, of conceiving and of comprehending the most complicated arrangement in one idea, which they alone possess.

BREADTH OF LIGHT AND SHADE is simply another application of the same term to a subordinate department, namely, chiar' oscuro. H. B. G.

BREAK. A projection or recession from the general surface either in moldings or in a wall. The term cannot be applied to the partial recess formed by a niche. The word is also used for the point at which the design of one mould, of a building commences to differ from the previous portion of the work.

BREAK. A term used at Leeds for the means of giving to slating a tilt at the eaves. BELL CAST. W. R. C.

BREAKFAST ROOM. The room which serves in a mansion for the first assemblage together of the family in the day, and so named from the meal which is there served to them. Except in very large houses, this apartment also serves as the morning room, and should, if in the country, open to the lawn and to a conservatory; when this latter is added, the room should be so placed that the conservatory will have the sun from sunrise till midday at least, while at the same time the breakfast room itself should have an aspect cool in the morning, but yet cheerful. It is more requisite for comfort that the room should be cool in summer than warm in winter, because it can always be warmed by a fire, but it is difficult to give the luxury of coolness in a summer morning if it have a warm aspect. Green is preferred for the prevailing colour of the apartment. In town and small country houses the dining room and the library are used as the breakfast rooms. H. B. G.

BREAKING IN. A term used by carpenters for cutting or rather breaking a hole in brickwork with a ripping chisel for the insertion of a plug, the end of a beam, etc.

BREAKING JOINT. A term used for the manner of placing bricks, stone, slates, or other materials, so that the joint of one piece is not in the same line as the joint of the piece next adjoining in the same plane. BOND; BRICK-BOND; MASONRY, etc. H. B. G.

BREAST. A term formerly applied to a torus molding. 4.

BREAST OF A CHIMNEY. The fore part *under* the mantel or chimney piece commonly made inclined, as it is curiously explained, *s. v.*, in CHAMBERS' *Dict.*, fol., London, 1786; at present it is applied to the wall carried up to the ceiling over the opening of a fireplace, which, in accordance with the Metropolitan Buildings' Act, need not be more than four inches in thickness: a system of building which is gradually being adopted in the country, where breasts fourteen inches and nine inches thick were usual according to old practice.

BREAST OF A WINDOW. The masonry or brickwork under the sill of a window.

BREAST SOMER, see BRESSUMER.

BREBION (MAXIMILIEN) was admitted a member of the academy of architecture at Paris in 1755. He is specially mentioned by AICARD, *Patrie*, 8vo., Paris, 1847, p. 2190, as having been architect to the Louvre, and as having, about 1778, made one of the earliest applications on a large scale of ironwork in the vault and roof of the great saloon of the museum in that edifice. 45.

BRECCIA. The term properly applied to stones principally composed of fragments of more ancient rocks, each piece being of a size between the rounded masses occurring in the stones called conglomerates, and the grains seen in the oolitic formations. These fragments are not crystallized, but are angular, or have blunted corners, and are agglutinated by a very distinct

pasto. Conglomerates as well as breccias may be found combined with small grains. The varieties of breccias are volcanic, quartzose, siliceous, siliceo-calcareous, schistose, schistose-calcareous, and calcareous; this last is the most common, to which some mineralogists would confine the term breccia marble, and to which the greater part of the following stones sold as marbles in commerce belong. They have the distinctive quality of showing no trace of magnesia, but are capable of taking a fine surface and polish. Those marked * are now only to be found in the remains of ancient monuments.

African breccia* is very beautiful and very rare, and has a black ground with spots of grey, dark red, and deep violet colour; it is also described as having a bright red and white ground with black veins, and is then procured from modern Italian quarries.

Aleppo breccia is also very rare, and has a yellowish-green ground, with spots of violet, green, white, yellow mixed with red, olive, etc., with straight pale white or grey veins through the spots. It is a Violet breccia, and is obtained from Saravezza and Fourni near that place.

Alet breccia, also called Aleppo breccia (the French terms *brèche d'Alep* and *brèche d'Alet* are easily confounded) is a modern marble found at Tolonet and Alet near Aix in Provence; it has a yellowish-brown ground with red and grey spots, and is colder in colour, but often sold as Arlecchino marble.

Arlecchino marble,* see Seme Santo breccia.

Barbazan breccia, from a modern quarry in the department of the Upper Garonne in France, is formed of black, brown, and white fragments.

Beaudan breccia, from a modern quarry in the same department, consists of close yellow, brown, and coral-red fragments; it is also called Caroline breccia.

B. antica, has round unequal spots, black, blue, red, grey, and white in colour.

— grande has large black spots with some shells, and is broken by zigzag white lines.

— piccola, has smaller spots, and the black inclines to a grey tint. Quarries of these two sorts have been found at Aubert, in the department of the Arriège in France.

B. bianca is violet, brown, and grey in colour, with large white spots.

B. dorata has red and white intervals between yellow spots.

B. gialla* possesses a clear yellow ground with deeper spots.

B. grossa has black, blue, red, grey, violet, brown, yellow, and white spots.

B. nera is a greyish-brown, with black spots and small white dots.

B. rossa antica,* very rare, has a clear deep red ground, with small rose coloured and smaller black spots; in some cases large white spots.

B. verde antica* has a beautiful grass green ground, with spots of dark green and pure white: the colours should be clearly marked, and if the green is at all greyish, the marble loses much of its value.

B. verde di pagliocco,* see Straw-green breccia.

B. verde sanguinea antica is sombre green ground, with red and black spots. Caroline breccia, see Beaudan breccia.

Coralline breccia is also called Serancoline breccia, because it resembles Serancoline marble in having coral-red spots.

Egyptian breccia, see Universal breccia.

Fior di Persica* breccia, see Persecchino breccia.

Isabella breccia has large bands of a dirty yellowish-white colour, with white and pale violet spots.

Italian breccia is of two sorts; one is called antique, and has black, white, and grey spots; the other is sometimes called Violet breccia, because that colour is occasionally found in addition to the others. These are procured from modern Italian quarries.

Memphis marble is a breccia with a violet ground and small white or grey fragments, from a modern quarry in Provence.

Partridge-eye breccia has a black and red ground with white spots.

Pavonazzo* breccia has a white ground with red spots.

Pavonazetto* breccia has a white ground broken by grey lines.

Penne S. Martin breccia, from an ancient quarry still worked at S. Beat, in the department of the Upper Garonne in France, is yellow, white, and grey.

Persecchino grande* marble or Violet breccia has a white ground, with lilac and violet coloured spots a foot in diameter.

Persecchino piccolo* marble has small similar spots; see Violet breccia: the same ground with rose coloured spots, is very rare.

Polzevera breccia is also called Suza green breccia; it resembles the Breccia verde antica, but is not so much esteemed.

Porta Santa* breccia is red and white.

Porta Santa* breccia fiorita is white or grey, bluish, with purplish spots.

Pyrenean marble is a brown breccia with spots of several colours.

Salvatera (Fr. *Sauveterre*) marble is a yellow, grey, and black breccia.

Saravezza (Fr. *Sauveterre*) marble is a breccia with a violet and brown ground, having large white and Isabella coloured spots; there is another sort, with spots of small size.

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Seme Santo,* Tracagnino, Arlecchino marble, or Virgin breccia, perhaps only found in fragments which have been used at Pompeii, has a brown ground with red, chocolate, bluish, yellowish, and white portions about an inch across. Seme Santo di Sette Basi, commonly called Sette Basi breccia, is the same with the addition of violet spots, and sometimes said to be so called in consequence of its seven colours; but the name is also given to a rare specimen of Violet breccia, which is now only found in the ruins called Sette-Basi, situated about two miles from the Monte del Grano, a ruin three miles on the via Latina from Rome.

Serancoline breccia, see Coralline breccia.

Straw-green* breccia, also called Breccia verde di pagliocco, has a straw-green ground with greenish and yellow spots.

Suza green breccia, see Polzevera breccia.

Tracagnino* marble, see Seme Santo breccia.

Universal breccia and Pietra fructuosa, see SILICEOUS BRECCIA.

Verona marble is a red breccia containing pale red, crimson, and blue portions, from the quarries at Vallarsa in the Trentin.

Violet breccia, a dirty brown ground with long violet bands and spots, mixed with white; but see Persecchino marbles, Italian and Seme Santo breccia.

Virgin breccia,* see Seme Santo breccia; it is also described as having on a chocolate ground little white or reddish spots and red points.

The quarries from which immense quantities of breccia were raised by the Egyptians and Romans are described in the *Handbook for Egypt*, p. 399, as situated about half way between Thebes and Kossayr. Several Spanish breccias have been found, but are not exported. BRARD, *Mineralogie*, 8vo., Paris, 1821, mentions a few others which are rarely seen.

BRECCIA PORPHYRY, see PORPHYRY.

BRECCIOLI (BARTOLOMEO), born at S. Angelo in Vado, in the territory of Urbino, was a pupil of Domenico Fontana. He was first engaged upon several works at his native place, and on the mole at Fano, and the harbour at Pesaro: at Rome he rearranged and restored the palazzo Gaetani on the Corso, the cornice and central belvedere of which were particularly his design, the rest being partly designed by Martino Lunghi the younger; he also rearranged and restored the palazzetto of the Amadovi, near the Arco di Portogallo in the Corso; and the palazzo Nari, near the casa Pia. He was engaged upon various portions of the convents of Sta. Maria della Scala and Sta. Maria della Vittoria. But his most important works were the dwellings de' Clavarii, near the church of S. Ignazio Loyola; the stabling in front of the palazzo for the cardinal Lanti; additions to the palazzo Mattei; the church of Sta. Teresa, and the Carmelite nunnery in the Strada Pia; the gallery of the palazzo Massimi in the piazza di Sciarra; and the high altar of the convent of S. Giuseppe a Capo. After the death of Carlo Maderno he had charge of the fabric of the Monte di Pietà; and under Urban VIII (1623-44) he became sub-architect of the buildings at Castel Gandolfo and of the pontifical edifices at Rome. He was also employed in the neighbourhood of that city, especially on the estates of the Gaetani family at S. Felice, for whom he built a tower on the sea-shore near Monte Circolo. He died in January 1637, and was buried in the church of Sta. Susanna at Rome. 28, 38.

BRECCIOLI (FILIPPO), brother of the preceding, was connected with Carlo Maderno, in whose office he was engaged until 1629. He was also a pupil of Francesco da Volterra, under whom he superintended the works at the church of S. Giacomo degl' Innocenti, in which at a later time he designed the chapel of the Jacobacci. As architect to the Orfanelli he planned and finished the collegio Salvati, and the orders of the façade to their church in the piazza Capranica: he was also architect to the monks of S. Francisco di Paolo on Monte Pincio, where he erected the sacristy and the chapter room: the dwellings of the Vigevani next to the church del Gesù were united in one design by him. He died 16 April 1627, at the age of 53, leaving a son Luca Antonio, who was also an architect. The name is sometimes spelt Breccioli. 32, 38.

BRECHIN. A city of Forfarshire in Scotland. The former cathedral church was a building about 166 feet long and 61 feet wide, in the First Pointed style; fragments of the choir

still remain, but in 1806 the transepts were destroyed, new aisles were built on each side of the nave, and one roof was made to cover the whole area, which contains 1,500 sittings. At the west end of the nave, which has a later four-light window, is a square tower of the same style as the church, on the north side; a leaning round tower of remoter date occupies a somewhat corresponding situation on the south side; this, commonly called the little steeple, tapers slightly upwards for 85 feet to the cornice, and is said to vibrate visibly during high winds: both towers have modern terminations, which make them respectively 128 and 108 feet high. GORDON, *Itinerarium Septentrionale*, fol., London, 1726, p. 165, states that the round tower consists of sixty regular courses of stone 44 inches thick, and is 47 feet in external circumference; BILLINGS, *Baronial, etc., Antiquities*, fol., Edinburgh, 1848, i. The town house, rebuilt about 1806; the ruins of the ancient chapel of the maison Dieu, now used as a stable, in the upper part of the town; nine churches or chapels, four of which have been built since 1835; and three educational institutions, are the objects of architectural interest. The castle presents only scattered portions of the old work, having been altered into a commodious mansion in the early part of the last century. 14. 50.

BREEZE. When coal ashes are passed through a fine sieve the smallest portions called *soil* are reserved for mixture, as allowed by 3 George II, cap. 22, with clay for brick making; and the larger, called *breeze*, form the fuel for burning raw bricks. This last use of it was prohibited by 12 George I, cap. 35, but allowed by 3 George II, cap. 22, and 10 George III, cap. 49. In these Acts there seems to have been some confusion between the terms *breeze* and *ashes*—the finer and coarser sort. Where sand cannot be easily obtained, breeze, which should be well ground, is frequently used in the composition of mortar.

The probable origin of the discovery of coal ashes as above described for fuel in brick making, may be referred to some experiments on an invention said to have been proposed by Captain Perry, by whose talents the *breach* in the Thames embankment at Dagenham, which occurred in 1707, was stopped. At any rate it occurs in a little pamphlet on that subject, now scarce and generally imperfect. The invention is described to be not only to economize fuel, but to heat rooms where there are smoky chimneys. The author speaks of the increasing use of sea coal, or pit coal; of the waste of the ashes therefrom; and of these ashes being not like the ashes of wood, but containing a great deal of matter which is combustible in close masses, where little air can come. Of course all this was long before the properties of coke, or the existence and agencies of oxygen, were dreamed of. The author proposed to get mild clay, to mix it with these ashes, having first roughly pounded the lumps, to make the mixture up into balls the size of cannon shot, to ignite them by placing them on any common fire or in an oven, and then to convey them to the room where they were wanted, and to place them on the hearth in a pyramidal pile. He relates how many hours they will keep their heat, and how admirably the glow will warm the room; how cleanly they are, being free from dust; and what a victory will be achieved over an obstinate chimney, there being no smoke. Such *fire balls*, as they were called, are still exposed for sale in London. The difficulties appear to have been, first, to get these masses into an ignited state; and second, when in a heated condition, to have carried these glowing cannon balls from the kitchen to the withdrawing room without great labour, and danger of accident. When burnt out these balls would have exactly resembled the texture of a London brick in every respect but one; and that is, having been exposed to an unlimited quantity of air during combustion, the outside would not have become semi-vitrified—a most important consideration. It is not improbable that these fire balls may have been the origin of the London or clamp system of brick making, as

described under **BRICK MAKING**. Fine charcoal is sometimes also called *breeze*. A. A.

BREGAMENGAN (GIACHUS) is recorded as the master of Giovanni da Bologna by LOMAZZO, *Trattato*, 4to., Milan, 1584, p. 688, and is therefore the same as JACQUES DE BREUCK.

BREGNI or **BREGNO** (ANTONIO) is mentioned as the architect of the scala dei Giganti and of part of the cortile of the ducal palace at Venice by SANSOVINO, *Venezia Descritta*, 4to., 1663, pp. 181, 320; see RICCIO (ANTONIO).

BREMEN. The capital of the free Hanseatic state of the same name in North-west Germany. It is divided into the "old" and the "new" town by the river Weser; these portions connected by a bridge were once surrounded by fortifications which are now made into gardens, but the nine gates still remain. Of the nine churches, that dedicated to the Virgin, with a leaning tower; that to S. Stephen, 1164-73; and that to S. Ansarius, 1230-43, with a steeple 324 Bremen feet, or about 307 feet 6 inches English high, are the principal, with the church of S. Peter, which until 1648 was the cathedral of an archbishop. This building is said to have been built in 1160, it is 296 feet long, 124 feet wide, and 105 feet high, and has a square eastern end, and an open gallery to the north-east aisle; *Le Moyen Age Monumental*, pl. 421.

Underneath it is a crypt called the *bleikeller* or lead cellar, in which the lead for the roof was cast; corpses are now exhibited as having lain in that cellar for two centuries. The *stadt-haus* or town hall, formerly the archiepiscopal palace, has been restored, and its arcaded portico thrown open to the public; the *rath-haus* or former town hall, built 1405-10, adjoining it on the west side, contains the celebrated *rath-weinskeller* or town council's wine cellar, one portion of which is fitted up for the reception of visitors, and at its extremity is the *akoustik-kammer*, a sort of whispering gallery. The other leading buildings are the *schütting*, in which the elders of the mercantile body held their sittings; the *borsenhalle*, with an auction room over it; and the *börse* or exchange, built in 1608, with its noble concert and ball rooms; the *korn-haus* or granary (1591); the weighhouse and the arsenal; the museum, built 1801; the public library, dating from 1786; four or five large schools; the *Olbers* observatory; the theatre: the *arbeits-haus* or house of industry, a building of some pretensions; the *kramer-amthaus*, built 1619; the *mann-haus*, built 1678; the *Catharinensstift*, built 1820; six or seven other hospitals and asylums; the Union and Erholung club-houses, or rather casinos; and the offices of the banking and insurance companies. The water-works, close to the bridge, have a wheel which lifts about 7,200 gallons per revolution, in intervals of seventy-two seconds. The *Neueste Wegweiser*, 16mo., Bremen, 1848, contains a good plan of the city. DELICHIUS, *Chronicon Urbis Bremæ*, 4to.

BREMEN (HEINRICH VON), entitled the *Rathmaurermeister*, directed in 1381 the building of the choir of the church of S. Nicholas at Wismar. 92.

BRENNA (V . . .) is said to have carried out a design by Bazhenov for the palace or rather castle of S. Michael in S. Petersburg, but he published superb engravings of this edifice, under the title *Disegni dell' imperiale palazzo S. Michele e sue adiacenze . . . architettura del cavalier Brenna Romano consigliere di Stato attuale, e architetto delle LL. MM. II. socio di diversi accademie*, fol., S. Petersburg. The edifice was erected of granite by the emperor Paul (1796-1801), on the site of the old summer palace on the Fontanka, which was pulled down by him; it is said to have cost £3,000,000; a small view of it is given by GRANVILLE, *S. Petersburg*, 8vo., London, 1828, ii, 80. It was restored by the emperor Nicholas; the expense of removing the rubbish was £3,750; and it is now the public military school for the education of engineer officers. The obelisk of black granite from the Jerdopol quarries, erected in 1799 in honour of the victories gained by marshal Roumiantzov-Zadounaisky, which is 82 feet 6 inches high; the exercising house, 536 feet 8 inches long and 119 feet wide; and

the two pavilions, all in front of the palace, are given in the above-named work by Brenna, who was succeeded by his pupil Rossi. In 1801 he altered the imperial library into the little theatre, and in 1802 finished the building of the church of S. Isaac, which had been begun in 1768 by Wüst and Stengel. In 1814 he was rewarded with the post of privy councillor. 68.

BREPHOTROPHEIUM. The term used by classic and mediæval writers for an hospital for the education of foundlings, orphans, and poor children.

BRESCIA (the Latin *BRIXIA*). The capital of the province of the same name in Lombardy. The city measures about a mile on each side. It was a station of some consequence on the Via Emilia, close to the river Mela, which still retains its ancient name. The fortifications are exceedingly fine, and are attributed to San-Michele. The entrance to the castle and one of its towers are remarkable. The town is very picturesque, the streets narrow, many with arcades, the exterior of the houses in several are covered with frescoes, the subjects being chiefly allegorical. The remains of an ancient aqueduct exist outside the town, and within the walls are many vestiges of antique art and indications of a theatre; there are also some columns of a Corinthian order buried up to their capitals and supporting a richly sculptured entablature, which are allotted to the forum of Arius. The chief point of interest in Brescia is the *museo*, built as a *cella* to the remains of the portico of an ancient temple to Hercules; the angular piers of the portico are remarkable, being formed of two half-columns joined to a pilaster; one only of the columns which is of the Corinthian order is perfect, and until 1820 alone indicated the existence of the treasure around. The foundations are of an older structure. The masonry of the basement is of marble without any horizontal joints. The steps are perfect, and are among the few examples of those portions of an antique edifice. The collection is rich in bronzes, a great number of which were found in the vaults of the building; of mosaic pavements, of ancient and mediæval antiquities finely sculptured, one of the most curious being an Ionic capital with angular volutes; and of several specimens of the ornament called a Runic knot.

The town itself has little architectural importance except what it derives from its *Palazzo della Loggia*, its *broletto*, and some churches and palaces, which have escaped injury not only from the explosion of a powder magazine, 10 August, 1769, but from the recapture of the city by the Austrians, 13 March, 1849. The *duomo Vecchio* or old cathedral, under the invocation of the Assumption of the Virgin, is illustrated by GALLY KNIGHT, *Ecclesiastical Architecture*, fol., London, 1842, i, 21, by whom it is said to have been built in the sixth or seventh century on the site of a temple to Diana. It is built of stone with brick dressings; the interior, which has been much altered, has a dome carried on eight isolated piers; externally it is divided by pilasters into twenty-four sides on a circular base. The *seuolo* or crypt is older, and contains forty-two columns of marble with some very remarkable capitals. The new cathedral, under the same invocation, is said to occupy the site of the old baptistery, whereas the circular plan of the old cathedral suggests that it was a baptistery. It was commenced in 1604, from the designs of Giambattista Lontana; it is said to be 108 paces long, 86 paces wide, and 264 feet high to the top of the dome; this dome, of an octagon form, was completed by Vantini in 1825, and is presumed to be inferior in size only to those in Italy of Rome and Florence. The edifice is built of a calcareous white stone, a bastard marble from the quarry of Bottesina Matina, situate four miles distant; the large columns of a Corinthian order are in three blocks only. Of the forty other churches nine are deserving of attention. Sta. Giulia, built in 1599 (GALLY KNIGHT, i, p. 21), the convent adjoining has a fine cupola, and an arcade of the Lombard age; S. Salvatore, Early Lombard, is now a barrack; Sta. Maria de' Miracoli, built 1487-1490, from the design of Ludovico Beretta, with a façade covered with delicate arabesques executed by Brignola about

1520-1530; the church of il S. Corpo di Cristo contains a fine monument of black marble with bronze ornaments richly sculptured of the sixteenth century, to Antonio Martinengo, who died 1526; S. Pietro in Olivete, altered and partly rebuilt by Sansovino; Sta. Afra, upon the site of a temple to Saturn, is chiefly visited on account of its ancient crypt and cloisters; S. Francisco, having a picturesque cloister; S. Giovanni Evangelista, the primitive church of Brescia, rebuilt in the sixteenth century; and S. Nazario e Celso, rebuilt in 1780. The great hospital, with its church to S. Luca; another, with a church to S. Carlo; another, La Pietà, with a smaller church founded in 1523; the episcopal palace; two Monti di Pietà; five or six important colleges or schools; a public library of the date 1750, in which is preserved the *Croce Magna*, of Byzantine workmanship set with gems, forming a very remarkable relic; an elegant modern theatre, the interior decorated in the style of the sixteenth century; and a handsome corn market, attract little attention in comparison with the *palazzo municipale*, or *della loggia*. This edifice, one of the four principal town halls in Italy, was commenced from the designs of (according to some authors) Bramante in 1492; of Tommaso Formentone, according to ZAMBONI, *Memorie*, fol., Brescia, 1778, who fully illustrates it; it was continued by Sansovino, and finished by Palladio, to whom the windows are unanimously ascribed. On one side is an arcade with a richly carved entrance, above which is the council chamber and the *ringhiera* projecting over the piazza; an open staircase is on another side. The richest marbles are used with decorations throughout the exterior. The interior was burnt 18 January 1575, and has not been restored. The *broletto* or ancient palace of the republic, forms with the cathedrals one side of the *piazza grande*; this building, which is of brick with terra cotta ornaments, is said to date from the end of the twelfth century; it has a fine lofty tower and deeply cleft battlements. Adjoining it is the *torre dell' orologio*, with a picturesque portico and tower rising out of it. The *torre di pallade* is a fine specimen of the solid square towers erected when fortifications were so essential; it has lofty battlements and a high projecting base at its foot, with a fountain and statue of Pallas erected by Pietro Maria Bagnatore in 1596, which is now used as a public washing place. This fountain is perhaps the best of the seventy public ones.

The city may be said to have been almost rebuilt by the two TURBINI, father and son; the latter designed the palazzi Durini near Sta. Croce, Ugoni,* and Onofri near the Miracoli, the palazzetto Fanaroli, the Casa Torriceni near the Grazie, and the church with the houses of the order of Malta. The palazzo Martinengo Cesaresco is by Palladio.

The cemetery or *campo santo*, just without the west gate of the city, was commenced in 1800, upon the designs of the local architect Vantini, and is not yet completed; it is ranked next to that at Bologna. It consists of a central circular chapel of Grecian Doric, with a flat dome 30 feet in diameter, 30 feet high, and of white marble; a long peristyle on either side connects two small porticos forming the entrances into the principal cemetery, which is surrounded by a peristyle broken by porticos, and beneath which are the catacombs. In the centre rises a Pharos, a flat pyramid with an external portico and an internal staircase leading to the top 150 feet high.

ROSSI, *Memorie Bresciane*, 4to., 1693; LABUS, in his different works; ANNALI DELL' ISTITUTO, 1839, p. 182-183; BROGNOLI, *Nuova Guida*, 8vo., Brescia, 1827; SALA, *Antichi Monumenti*, Brescia, 1829. Several casts from the above-named buildings are placed in the museum of the School of Practical Art. O. H.

BRESCIA (GIRALAMO DA) commenced, in a Pointed style, in 1502, the church of Sta. Giustina at Padua, which was completed from the designs of Andrea Briosco, or of Andrea Morone, 1532-1549. 28. 73.

BRESCIANI (MARIO) designed, about 1240, the now destroyed church of S. Francisco, belonging to the Minorites, at Bologna. 91.

BRESLAU (in Polish, WRATISLAW). The capital of the province of Silesia, and the third city in Prussia. It is of an oblong quadrangular form, and after a fire in 1342 was laid out with regular and wide streets in which the wide-fronted and handsome houses contrast cheerfully with the massive and sombre public buildings. The fortifications destroyed in 1813 were converted in 1815 into *boulevards*; and the suburbs, which were burnt in 1806, have been rebuilt to correspond with the city. The various divisions of the town communicate with each other by means of a hundred and twenty bridges, of which six only are large; that constructed of cast iron in 1822, weighing one hundred and forty-three tons, and called the King's Bridge, is the handsomest in itself, and in its approaches, which are large *plätze*.

The town was made the seat of a bishopric in 1035; the cathedral, dedicated to SS. John the Baptist and Vincent, was built 1148-1170, and was restored in 1759, after a fire. Of the fifty churches and chapels the most important are those dedicated to the holy cross (the *kreuzkirche*), dating from 1288, and built on a crypt of the same extent, which is dedicated to S. Bartholomew; that to S. Elizabeth, which has a tower about 360 feet high, the tallest in Prussia; that to S. Mary (1330-1336), with aisles higher than the nave, and alternate vaulting; and that to S. Dorothea (1350), which is the highest in the town. Breslau is said to contain more than two hundred and fifty public buildings: the principal ones are the vast episcopal palace, a *seminarium*, a monastery, and two convents; the *rathhaus*, or town hall, said to have been built about the beginning of the fourteenth century, and reported to have the tallest tower in Germany; the weigh-house tower (1571), opposite to it, and in the centre of the *grosse-ring*, or parade square; the government house, formerly the palace of count Hatzfeld; the university buildings, with a library of two hundred and fifty thousand volumes; a gallery of seven hundred pictures, museums, and an observatory; the *schloss* or *burg*, afterwards a college of the Jesuits, and now belonging to the university; the *schloss*, castle, or royal palace, built after 1748 by Frederic II; the public library, the arsenal, the exchange, the new exchange buildings in the *Sandring* or *Blucher-platz*; twenty-five large and thirty small schools; fourteen small public libraries; ten small museums; several hospitals and asylums; a mint, a bank, a theatre, barracks, and some private societies. The great sugar refinery is also considered a remarkable building.

BRESSANONE, in the Tyrol, the Italian name of BRIXEN.

BRESSUMER, BRESSUMMER, BRESTSUMER, BRENTSUMMER (as in the Building Act 7 and 8 Vict., cap. lxxxiv), properly BREASTSOMER (Fr. *sommier*). A timber beam placed across an aperture in the external walls of buildings, to support the construction above such an aperture. At the present day it is rarely employed, except at the ceiling of the story level with the street; in printed explanations of the last century the word is defined as "a piece of timber in the outward parts of buildings, and in the middle floors, into which are framed the *girders*", i.e. the largest pieces of timber in a floor. "The ends of these are usually fastened into the summer or brestsummer, and the joints are framed in at one end to the girders, which are of the same size as the summers; joists 6 ins. or 8 ins. square are framed into the girders and summers, and take the boards." The word summer-tree also denoted a beam into which the ends of joists were fastened, and into which the girders were framed. In the timbered and half timbered buildings of our ancestors, its chief use was to carry the beams (now called joists) of each upper story. The term SUMMER seems also to have been applied in old documents to the large timbers which are now called girders. Beams of iron placed across apertures in the external or internal walls of buildings to support the upper portions of the walls are now called bressumers.

W. H.

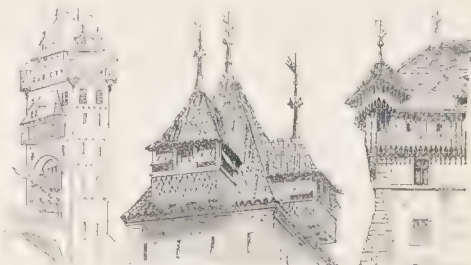
Some useful observations and diagrams respecting bressumers and the employment of them, and the insertion of arches in lieu

of them, are given by BARTHOLOMEW, *Specifications for Practical Architecture*, etc., 8vo., London, 1840; this portion was reprinted in the *BUILDER Journal*, ii, p. 7.

BRETASCE, see BRETESSE.

BRETESMONTS, BRETISMENTS, and "*bretissementa batellata et kinnellata*", are mentioned in the contract for building the dormitory of Durham abbey, given by the SURTEES SOCIETY, *Historiæ Dunelm. Scriptores tres*, 8vo., London, 1839, appendix clxxx-lxxxi, and mean parapets, as is evident from the context, and from the passage in HOLMES, *Academy of Armory*, fol. Chester, 1688, who, 3, i, 25, has the passage, "bretesches or parapectes or battlements, or tops of a wall upon a tower"; but, 1, iii, 76, iv, 32, 68, and v, 1, 14, has drawn a clear heraldic difference between "battelling" and "bretressing", which latter as he intimates was sometimes called, "bretressing".

BRETESS, BRETEX, BRETISE, BRETTESSE, BRETTISS, or BRETTYS. The English forms of the older words *bretasce* and *bretesche*; in late Latin, *berteschia*, *berthesca*, *bertresca*, *betrescha*, *brestachia*, *bresteschia*, *bretagia*, *bretschia*, *bretescha*, *breteschia*, *bretschia*, *brisecha*, *bristegus*, and *breteschia* (It. *bertesca*; Fr. *bretèche*, and formerly, *bertèche*, *brestache*, *bretage*, *bretesque*, *bretesche*, *breteske*, *bretesque*, and *bretesche*). An enclosure projecting before the face of a wall, and supported on corbels. DUCANGE, *Glossary*, s. v. *berthesca* and *bretachia*, quotes, "*fiat fenestra vel berthesca vel avantsolier;—faire bretesques, boutures, saillies ni autres choses sur la rue;—fecisse in domo sua quandam bresteschiam ligneam et quadam alia ad fortensiam pertinentia*"; and is illustrated by an illumination, dating from the fifteenth century, in a manuscript copy of FROISSART, *Chronicles*, c. 184, in the Imperial Library at Paris, which is engraved in the edition by JOHNES, 4to., London, 1839, p. 242, and shows a kind of BARBICAN that might be a movable precaution in fortification. VIOLLET LE DUC, *Dict.*, s. v. *bretèche*, also adduces two other examples



engraved from drawings of similar constructions: one apparently belonging to the end of the fourteenth century, and still forming part of the *tour des deniers* at Strasburg; the other, an angle one, which he deems to be that originally constructed in 1388, on the *douane* at Constance. This author thinks the *tourrelles* on the angles of French and Scottish dwellings to be constructions of a similar design; and the small two-storied balconies of the time of Francis I, which flank one of the exterior fronts of the château at Blois, are called by him "true bretèches". He mentions the cities of Augsburg, Innsbruck, Nuremberg, and Prague, as containing private houses dating in the fourteenth and two following centuries, which have one or more closed *bretèches* on their fronts; and these examples elucidate passages quoted by DUCANGE, s. v. *berthesca* and *bretachia*, viz. "*les criées fut continuées par quatre Mercredis à la bretesque à Lille*" (anno 1390); and "*si c'estoit à adjourner une communauté—que ce fust fait à bretesche*". CHARONDAS explains this passage by the annotation that "*bretèche*, an ancient term found in some old chronicles and customs, even Flemish ones, signifies the public place in which cries, publications, and proclamations, were made"; and adds in another place, "whence comes the word *bretesque*", which

is not to be found in the *Dictionnaire de l'Académie Française*, although the *Complément* to that work gives "breteque, a market-place". Another remarkable passage is given by DUCANGE, viz., "eussions fait appeller icellui Jaqueme de Langle à la bretesque de la maison de le pais; feust venu personnellement pardevant nous en ledite cambre lidis Jaqueme"; this is explained in a measure by the observation of VIOLETTÉ LE DUC, that a kind of enclosed verandah, or balcony-verandah, appears on the façade of the *hotel-de-ville* at Luxeuil; and remnants of another on that of the corresponding building at Arras. He compares them to the *loggie*, *belvederi*, and *ringhiere*, of Italy. MENAGE derives the term *breteche* "from the Italian word *bertesca*; in Latin, *propagulum*, a barrier customarily erected before the gates of palaces"; but is not corroborated either by the definitions or the quotations given by the ACADEMIA DELLA CRUSCA and by ALTIERI. The English words *betrasce*, betrays (? *bretrays*), and betrax (? *bretrax* or *bretrax*); the French words *brestache* and *bresteché*; and the terms *bretrasyng*, or *bretrasyng*, are translated in old Glossaries by the Latin word *propugnaculum*, which has too equivocal a significance to throw a clear light upon the subject. MATTHEW PARIS, *Historia Major*, fol., London, 1640, p. 321, says "testudines quas Gallice brutescas (? *bretesches*) appellant." This is well sketched by VIOLETTÉ LE DUC, i, p. 348.

The preceding article is open to the objection that it does not include other explanations given by DUCANGE, s. v. *berthesca* and *betrachia*, and by VIOLETTÉ LE DUC, *Dict.*, s. v. *breteche*, viz., wooden castles, or towers, or pulpits, which, however, are not supported by the mass of their own quotations; but such a *propugnaculum* appears from those very authorities to have been of wood, "combuserunt etiam bertescas novem", and to have been neither a castle nor a tower; "circumierunt civitatem castellis et turribus ligneis et bertescis". The intimation given by HOLMES, *Academy of Armory*, fol., Chester, 1688, I, iv, 32, that *bertescas* appear like "strong staves", suggests *palisade* or stockade as the right explanation of *propugnaculum*, and of "a *breteche* brade" in the story of Ywaine and Gawin (RITSON, *Ancient English Metrical Romances*, 4to., London, 1802, i, 8). It applies where *barbican* and *balcony* fail, to all the passages quoted by DUCANGE and VIOLETTÉ LE DUC, such as "sepe sine bruteschia"; "ad merennia *bretragarum* levanda"; "le pount qe fust mult bien afforcé des *bretrages* et *barriers*"; and even gives a clear notion to "sua *grangia* et *bruteschia*"; "*bruteschiam* quam...tenet de eodem rege"; and "fabricavit *brestachias* duplices...castella videlicet *lignea* munitissima".

BRETEX, BRETISE, and BRETTISS, see BRETISS.

BRETtingham (MATTHEW) built in 1742 Norfolk House, No. 21 S. James's-square, London: Langley Park in Norfolk, about 1740-41 according to NEALE, *Views*, 4to., London, 1820, iii; and GANDON, *Vitr. Britt.*, fol., London, 1767, i, pl. 5-7, attributes to him the house, No. 86 Pall Mall, London, of the duke of York, brother to George III (this dukedom existed only from 1760 till 1767); this house, afterwards called Cumberland House, is now used as the Ordnance Office, and much altered. Brettingham is best known by his publication of the *Plans, etc., of Holkham* in Norfolk, the seat of the earl of Leicester (who enjoyed the estate from 1707 till 1759), fol., London, 1761, which reappeared in 1773 "with the ceilings and chimney-pieces, and a descriptive account not in the former edition", at the expense of the dowager countess. So much has been said against this architect by the partisans of Kent, that it is only right to observe that the share which Kent had in the works, commenced in 1729 and completed to a certain extent in 1764, is clearly described in the preface to the last edition of that book; and that Brettingham was then dead appears from the following passage: "The care of proportioning the parts at large, and the detail of each member of the buildings in particular, was committed by the earl of Leicester to the superintendence of his own architect, the late Mr. Matthew Brettingham of Norwich, the first publisher of some part of

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this work, who in the knowledge of sound building, as laid down in the school of Vitruvius, was allowed to equal, if not excel, all the professors of his time; and in fact the characteristic merit of Holkham is most discernible in the accurate performance of its workmanship." The *Description* further shows that he was purchasing in 1750 pictures and statues in Italy: he was in that country in April 1748 with Hamilton, STUART and REVETT, as stated in their *Antiquities of Athens*, fol., London, 1813, iv, preface, xxix.

BRETtingham (ROBERT FURZE), supposed to have been a nephew of the above, was born about 1750, and was probably the author of the *Description* mentioned in the preceding article. He returned from Italy about 1781, and exhibited in 1783 a drawing of an antique fragment in the villa Medici at Rome; as well as two drawings for a sepulchral chapel; in 1790 the design of a bridge built the year previously at Benham Place in Berkshire; and in 1799 the entrance front of the church at Saffron Walden, "restored in 1792", as well as a view of the interior. In the course of a very large practice he succeeded to Blackburn in the erection of gaols, building those at Reading, Hertford, Poole, Downpatrick, and in 1794, at a cost of £16,000, the new gaol and house of correction at Northampton; also a fine room in the rear of his residence, No. 9 Berkeley-square, London, when he parted with it to the marquis of Buckingham; the temple of Concord in the grounds at Saffron Walden in Essex, for lord Braybrooke; and a large mausoleum in Scotland for the Fraser family. He was also engaged at Rochampton in Surrey, and at Hillsborough House in Ireland, both for the marquis of Downshire; at Longleat in Wiltshire; at Felbrigg Hall in Norfolk, for the Right Hon. W. Wyndham; at Chailton in Wiltshire, for the earl of Suffolk; and lastly at Waldershare in Kent, for the earl of Guilford. For the duke of Leeds he built No. 19 S. James's-square, London, now the town residence of the bishops of Winchester; and is supposed to have built Maidenhead bridge over the river Thames; Buckingham House, No. 91 Pall Mall, rebuilt by Sir J. Soane in 1794; Sir F. Burdett's house, No. 80 Piccadilly; and some works at Lansdowne House, Berkeley-square. He was associated in 1791 with the leading architects of the time (MCLVANY, *Life of Gandon*, 8vo., Dublin, 1846, p. 296), and retired from the post of resident clerk in the Board of Works at Midsummer 1805.

Amongst his many pupils, the only one who has continued in the profession is Mr. George Smith, F.R.S., by whom the above particulars have been chiefly communicated.

BRETIEMENT, BRETISS, BRETISS, or BRETISSYNG, see BRETIEMENT and BRETISS.

BRUCK (JACQUES DE) the elder, also called du Brucque, du Bruck, Beuch, Brusca, and even Brucer by VASARI, and Bregamengan by LOMAZZO, was born at S. Omer according to GUICCIARDINI, but at Mons according to DE BOUSSU, *Histoire de la Ville*, 4to., Mons, 1725. On his return from Italy to Hainault he became sculptor and architect to Mary, queen dowager of Hungary, and governess of the Netherlands from 1532, for whom he built a palace at Binch, about ten miles from Mons, and the château of Mariemont, about three miles from the palace: both edifices were destroyed by the French in 1554, but the château was afterwards rebuilt. In 1539 he designed the château de Boussu, six miles from Mons, for Jean Hennin, comte de Boussu, which suffered a similar fate; the existing ruins of this edifice prove the magnificence of a work which was the most richly decorated private residence of the time in the Low Countries, and served as a substitute for Italy to those artists who could not travel to so distant a school. 97, 98, 101.

BRUCK (JACQUES DE) the younger, is supposed to have been the son of the above named. He built in 1621 several considerable edifices at S. Omer, and in 1634 the superb Benedictine monastery at S. Guilain, about six miles from Mons: these buildings, destroyed in 1656 by the explosion of a powder magazine, were rebuilt in 1714 under Gabi de Rijsscl

and Dubressi of Mons. His portrait is included in Van Dyck's collection. 97. 98. 101.

BREWERY (Sp. *cercece*; Fr. *brasserie*; Ger. *brauerei*). A range of buildings appropriated to the manufacture upon a large scale of the various beverages comprised under the name of beer. URE, *Dictionary*, 8vo., London, 1854, s. v. Beer, gives illustrations of an existing building, and also of a variation of one portion of his model. A section of Messrs. Furze's brewery is given in the *ILLUSTRATED LONDON NEWS*, xi, 408; and another with views of that belonging to Messrs. Barclay and Co., in the same paper, x, 92; a general description of a large brewery with illustrations, and a section of the fermenting room at Messrs. Whitbreads', is given by THOMSON, *Brewing*, 12mo., Edinburgh, 1849, pp. 115-20. Drawings of Messrs. Goding's brewery, which is considered one of the most compact and perfect of such establishments, are in the collection of the Royal Institute of British Architects.

BREWHOUSE. This term, the diminutive for brewery, is appropriated to a building fitted for the manufacture of beer on a small scale, as for private consumption. An architect arranging a brewhouse for domestic use has to provide room for the following utensils, which are sometimes regarded as fixed furniture, viz.: a copper set in brickwork; a mash-tub or mash-tun, sometimes called a mask-fat, which holds the malt while being mixed with hot water; an under-vat or under-back placed below the mash-tub; a jack-back or hop-strainer; coolers (when of iron they are 7 inches thick if the bottom be hollow to hold water), on a hanging level below the bottom of the copper and jack-back; and working-tuns or gyle (guile) tuns below the coolers. It is not usual but it would be well to provide a place for the malt, hops, and yeast, until they are used. The copper should be placed high enough to command all the other vessels, and should be large enough to hold double, or at least two-thirds more than the intended quantity of beer: thus, if from ten bushels of malt there is to be made as usual at one brewing three barrels or 108 gallons of beer, the copper should hold about 190 gallons of water; the old ale gallon being calculated at 282 cubic inches. The mash-tub, a wooden vessel with a perforated false bottom on which the previously crushed or ground malt is laid and damped, need not contain more space than half as much again as is required for the malt. If 408 gallons of water stand 22 inches high in the mash-tub, the addition of 376 gallons of malt will only raise the water to 29 inches; this gives the size of the mash-tub, and the necessary strength of its supports may be calculated from the data that a gallon of malt averages about eighteen ounces in weight, a little more than half the weight of that quantity of water. The first under-back, if there be more than one, should be large enough for the wort from the first mash, which may be 90 gallons; but it is sometimes made to hold between 130 and 160 gallons, calculated as the total of all the worts except those of the last mash, say 30 gallons. The worts, returned by buckets or a pump into the copper, are reboiled with the hops and passed through the strainer into the coolers, which are to hold all the worts at about 1½ or 2 inches depth of the wort if made of iron, but 3 or 4 inches if made of wood; and the brewhouse is rendered as subject to draughts of air as possible. It has been recommended that the coolers should occasionally be used altogether uncovered, and exposed to the sky. When sufficiently cooled, the wort is let into the fermenting or working tuns and violent fermentation is produced; after which the beer is run into barrels (placed upon troughs or gutters called stillions) according to some methods, or is turned into vats and racked into casks, or is tunned into casks according to the Scotch method. As all these last processes are conducted at temperatures regulated at between 50° and 65°, the ventilation of a brewhouse is of great importance; and in large brewhouses the coolers are placed in a separate apartment, and are only enclosed by louver boards and shutters. Plans and sections of brewhouses with wooden and iron coolers are given by LONDON, *Encyclopædia*

of Cottage, etc., Architecture, 8vo., London, 1842, § 2050 and 2051, who § 758 erroneously advises that the malt room should be over the brewhouse. A slate tray with an iron worm-pipe as a refrigerator is the most recent cooler. For cottage brewing at twice, say of four bushels, a copper and mash-tub each holding 40 gallons, two under-backs each holding 20 gallons, and three coolers each holding 10 gallons, are sufficient. BLACK, *Treatise on Brewing*, 8vo., London, 1849; BOOTH, *Art of Brewing*, in the *LIBRARY OF USEFUL KNOWLEDGE*, and *Appendix*.

BRIARD (PIERRE), see BIARD (PIERRE).

BRICCI or BRICCIO (PLAUTILLA) was a daughter of Giovanni Briccio (1581-1646) of Rome. She designed the chapel of S. Benedetto in the church of S. Luigi dei Francesi, which she decorated with her paintings, and built the palazzetto in front of the porta S. Pancrazio in that city. The villa Giraldi was built about 1660 by her, in conjunction with her brother Biagio, who was also an architect. 5. 83.

BRICK (Gr. *πλῖθος, πλῖθις*; Lat. *later; testa*; Fr. *brigue*; It. *mattoni*; Ger. *ziegelstein, backstein, brandstein*; Sp. *ladrillo*). Sun-dried brick (Lat. *later crudus*; Sp. *adobe*; Arabic *attob, tōb*). A factitious building stone, made from the silicates of alumina, and hardened by heat in three distinct ways: 1st, by being dried, or rather baked, by the heat of the sun only; 2nd, by being burned, or converted into a species of pottery, by direct action of fire; and 3rd, by being burned by fuel mixed up with the body of the material itself. The two former methods were known to the ancients; the latter is of late invention, and peculiar to England.

The most probable derivation of the word brick is from *imbrices*, the plural of *imbrex*, one of the species of tiles used by the Romans, from whence is derived the French word *brigue*, and thence the English form of the word. From a comparison of VITRUVIUS, lib. ii, cap. 3 and 8, STEPHENS, *Lexicon*, considers that *later* means an unburnt brick, while *testa* signifies the burnt brick; and he supposes that the latter word is a mere corruption of *lostia*. PAVING BRICK, etc. A. A.

BRICK AND BRICK MAKING, HISTORY OF. The earliest mention of bricks is in the book of Genesis, xi, 3: "Let us burn them with fire". The construction of the Tower of Babel was "brick for stone, and slime (*ἀσφαλτος* of the LXX, bitumen), for mortar." The mention in 2 Samuel xii, 31, of the brick kilns (*διὰ τοῦ πλῖθιου* of the LXX) is a proof that the Hebrews were acquainted with the method of building with burnt bricks; while the long details given in the books of Genesis and Exodus show that they had also made bricks after the Egyptian manner, namely, of crude clay mixed with straw, which was well suited to climates where there was little or no rain. WILKINSON, *Manners, etc., of the Egyptians*, 1st series, ii, 96-99, describes and engraves one of the paintings discovered at Thebes, containing the whole process. He also states that all the houses and even some of the small temples of the Egyptians were of this material.

The earliest mention of bricks in profane history is given by HERODOTUS, *Clio*, 179, and is the description of building the walls of Babylon: "They made bricks of the earth borne out from the trenches, and having drawn out a suitable quantity they burnt them in furnaces, after that, using hot asphalt for cement, and between every thirtieth course of brick (*διὰ τριήκοντα δόμον πλῖθου*) placing mats of woven reeds (*ταρσοὺς καλάρουν*), they built first the lips (*χεῖλα*, the retaining walls) of the ditches, and then the wall itself." Examples might be multiplied of the mention of bricks by Greek authors. Those burnt are called by them either *πλῖθοι ὀπταί* (HERODOTUS, *ut supra*), literally "cooked bricks", or as in several passages in XENOPHON, *Anabasis*, *πλῖθοι γῆναι*, "bricks of earth", and also *πλῖθοι κεράμει*, "pottery bricks"; while crude bricks are called *πλῖθος ὠμῇ* by PAUSANIAS, who relates that Agis, the son of Pausanias, besieging Mantinea, turned the course of the river against the walls of that town, dissolved them, and washed them down; "for the wall was built of crude brick (*ἐξ ὠμῆς πλῖθου*),

which truly is safer *against the shock of the military engines* (ἐπεὶ πόλεις, literally *city takers*), than either burnt brick or stone, for these last get broken, and fly out from their joints, which crude brick does not"; a fact which in the late treatises on fortification has been supposed a novel discovery.

The mention of bricks is very frequent among the Latin authors, especially COLUMELLA, *De Re. Rus.*, lib. ix, 1, 2, 6, 4; VARRO, lib. i, 14, 4; PLINY, *Hist. Nat.*, lib. vii, 57, xxxv, 48, 49; and VITRUVIUS, particularly lib. i, cap. 5, lib. ii, cap. 8, who also, lib. ii, cap. 3, devotes an entire chapter to the subject. PALLADIUS, apud *Scriptores Rei Rusticæ*, 4to., Lipsie, 1735, under the month of May, section 12, p. 961, says: "In this month bricks are to be made of white earth or *creta* (not chalk, but the white clay used by sculptors for modelling, which bears the same name in Italy), or *rubrica* (probably earth stained naturally with ochre), for those which are made in summer become dry on the outer skin (or surface) by the swiftness of the heat of the sun, the moisture being retained in the inside, which causes them to open in cracks. Let them be made thus: The earth (*creta*) being diligently cleansed from *terra (uncallow)* and all *asperitate* (hard lumps, stones, etc.), and being mixed with chaff, is to be laid in soak a long time, and pressed into a mould (*forma*) like a brick; then it is to be left to dry, and frequently turned to the aspect of the sun." It is curious that VITRUVIUS treats only of the sun-baked brick, or at all events does not describe the process of burning. He first defines the earth which should be used, much in the same terms, but at greater length, than PALLADIUS. His reason for choosing such earths he says is because bricks made of the sandy, chalky, or gravelly soils (*arenoso, calcuoso, neque sabuloso*) are liable to two objections: they seem sound (*graves*) at first, but are liable to dissolve with the rain, and the straw which is placed in them will not adhere on account of the stiffness (*asperitate*), what a modern brickmaker would call "bunkiness" of the material. VITRUVIUS agrees with PALLADIUS as to the time of making, and thinks that bricks should be kept two years before they are used, to prevent shrinkage and cracks. He says that at Utica bricks were used when five years old. He then says there were three sizes of bricks manufactured; one used at Rome, which the Greeks call διδραχον, one foot long and half a foot wide; the two others are used by the Greeks, one called *pentadoron*, the other *tetradoron*. *Doron*, he says, is the Greek term for a palm. The *pentadoron*, or brick of five palms, was used for public, and the *tetradoron*, of four palms, for private buildings. The palm here alluded to must not be confused with the present Italian palm, which is nearly nine inches long, and is the *palmus major* of the later Latin writers; but it is the *old* palm of four digits, or the width of four fingers, 2.914 inches, or nearly 3 inches. These bricks, therefore, were about 14½ inches, and 11½ inches square; QUATREMÈRE considers that they were cubes. VITRUVIUS then states that half bricks were made, and when used alternate courses (*ordines*) were laid of bricks and of half bricks; and when built *ad lineam* (by which it is supposed he means "when the perpend is kept") he says it added much to the beauty and the solidity of the work. He then speaks of bricks made in Spain, and near Marseilles, which were so light that they would swim when thrown into the water. The descriptions in PLINY are much like those of VITRUVIUS, whom he mentions in his introductory chapter, as one of the authors consulted by him.

The burnt bricks of the Romans are, as may be seen by inspecting any of their works, exactly like those of the present day in Italy, which latter are in fact *tiles*, made of clay, beaten flat, dried on the ground, stacked edge-ways in kilns, and burnt by the flame of wood; in every respect like our plain tiles, or rather foot tiles. The dimensions will be found under BRICK, SIZE OF. They were laid without doubt just as at present; the bricklayer spreads a quantity of mortar with his trowel (*trulla*), which he then puts aside and lays the bricks (*mattoni*) with both hands, drawing them a little sideways so as to flush up the end

joints. Nearly all the fine buildings in Italy, ancient as well as modern, are of brick, in some cases encrusted with marble sawn in slabs from ½ inch to 1 inch in thickness and fastened with copper cramps, or in other cases encrusted with an excellent cement. The one being called by some modern writers on æsthetics a 'wall veil', the other a 'sham'.

The ancient bricks are often stamped with the name or mark of the maker; a branch of a tree, a plant, an animal, or a deity, are frequently found, as well as the dates of the consulate, etc., (SEROUX D'AGINCOURT, *Recueil de Fragmens, etc., en Terre Cuite*, 4to., Paris, 1814, pp. 82-88.) The bricks made by the Legionarii have been found in Germany, at Cæreleon (ARCHÆOLOGIA, v, fol. 35), and at York (WELLBELOVED, *York*, p. 13, etc.) have also their stamp. In the south of Italy the use of bricks has continued much the same as it was in the Roman times. In the north, however, particularly at Bologna (*Illustrations*, pl. xvii), Padua, Milan, and Venice, many churches and other edifices partaking of Byzantine character, are of brick, with ornaments, dressings, etc., of TERRA COTTA. Italian bricks, ancient as well as modern, are frequently scored on the underside or bed, to form a firmer key for the mortar (BIFEDA).

For some time after the abandonment of Britain by the Romans, the art of the brickmaker is supposed to have fallen into disuse. For many centuries brick buildings were not erected, though tiles were made in large quantities both for roofing purposes and for pavements. The major part of the dwelling-houses being of timber, it is difficult to conceive, except in stone countries, how the chimneys could have been constructed without bricks. Many of the early erections contain great quantities of Roman bricks; no doubt taken from those buildings which were then scattered all over the country. The abbey of St. Albans is a very striking instance. MATTHEW PARIS relates (*Vit. SS. Abbat. de S. Alban.*) that the Saxon abbots had collected a vast store of materials to build a new abbey church; but in consequence of a dreadful famine which occurred just before the conquest, they were compelled to sell the stone, etc., which they had collected. The Norman abbot, Paul, A.D. 1077, wishing to rebuild the church, took the bricks (*tegulæ*) from the old Roman city of Verulam. With these he constructed the church. Some of the piers and arches of the nave now remain. The truth of this story appears clear from the fact that the Roman mortar, the characteristics of which are so well known, is found in many places adhering to the bricks. At St. Martin's, Canterbury; Darent church, Kent; Dover Castle church; Brixworth, Northamptonshire; at Barnack, and many other places this is the case. At Colchester Castle, and at the adjacent priory, Roman brick was used in the greatest profusion.

The earliest existing edifice of modern bricks is said to be the hall at Little Wenham, Suffolk. This is dated about 1260 or 1280. A good description with illustrations is given by TURNER, *Domestic Arch.*, 8vo., London, 1851, p. 151, who seems to think that the earliest brick buildings of this period were the work of Flemings, or at least were built of Flemish bricks. The bond very much resembles what is frequently called Yorkshire or flying bond. After this period, the use of bricks became more and more common, especially in those counties where stone is scarce. Norfolk and Suffolk contain many beautiful examples of mediæval brickwork, as Caistor Castle. In many places, after the Reformation, it seems almost to have superseded the use of stone.

Very many attempts have been made in different countries to manufacture bricks of sizes and shapes fitted for peculiar purposes. The earliest examples in our own country are perhaps the bricks molded for mullions, jambs, etc., during the Tudor period, of which Sutton Place, near Guildford, Surrey, is one example. Since this bricks of different forms have been made for bevel quoins, copings, etc.; but these more properly belong to TERRA COTTA. The bricks used as bonding headers by Sir Christopher Wren in the dome of S. Paul's must not be omitted: these were of the ordinary size, but double the length of the

other bricks, and go quite through the thickness of the dome. Radiating bricks have also been made for the voussoirs of arches, particularly sewers. The chief drawbacks in this species of manufacture are, first, the awkwardness of setting them in kilns, which necessitates their being burnt after the manner of pottery; and the second, the difficulty and expense of laying bricks of a large size and awkward shape. One of the chief causes of the cheapness of brickwork is the facility with which the brick is moved and laid by one hand only. If the bricklayer were compelled to lay down the trowel and use both hands, or if the bricks could not easily be placed in the hod, the trouble and expense would be doubled. The labour of hoisting and laying bricks is about 1½d. per foot cube, while that of Bath stone is at least 9d.

All bricks, during the early period, seem to have been burnt in *flare kilns* by the flame of wood, and to have partaken very much of the characteristics of tiles or other pottery. They are more or less red, as the earth contains more or less of the protoxide of iron; and are more or less sound in proportion to the careful preparation or "tempering" of the earth and the completeness of the burning.

After the fire of London there was an unexampled demand for bricks; the worst and commonest sort is said to have sold for £5 per thousand. This must have given a great impetus to brick-making; and the old system of flare-kilns, hack-houses, the slow methods of drying and burning, could not have sufficed to supply the market. Very bad bricks are, as may be supposed, constantly found in houses of that period. As the metropolis kept increasing in an extraordinary ratio, the demand for bricks became greater and greater. Instead of the small brick YARD, with a little kiln fitted to burn 20,000 bricks, it was found necessary to employ *acres* of ground; and now twenty or five and twenty acres of ground are often occupied by large manufacturers, who turn out ten to fifteen millions annually. Wood fuel became very scarce and dear, besides its inconvenience; but there was one sort of fuel which was then literally thrown away and wasted. This was the *ashes* of the sea coal fire, at that period coming into general use in London. The history of the great and important discovery of their fitness for brickmaking is utterly unknown. There is not even a tradition whence it came, by whom, or at what time. The operation may be described simply thus. The coal ashes are collected and sifted through a fine sieve. The finer portions, or *soil*, are mixed with the clay, and dried with it. The coarser portions, or "*BREEZE*", are laid on some ranges of bricks already burnt; the raw bricks packed on them as closely as possible; the breeze is then ignited, and communicates its fire to the soil within the bricks, which become a huge mass of intense heat, and continue in that state for a month or six weeks. At the end of that period they are thoroughly burnt, and semi-vitrified on the surface; a most important circumstance, as they then will throw off the water, and the internal portion of the wall in which they are used is kept dry; moreover, they are lighter than kiln bricks, and are so far more fitted for arches or for very high walls, where there is fear of their being crushed by the superincumbent weight.

BRICK, MANUFACTURE OF. The *London Method*, as the most important, will be described first. This manufacture is of two branches, *malms* and *commons*, in which latter is included the *half-washed*.

Brick Earth. The usual term for the clay of which bricks are made. That for *malms* is of two sorts, *natural* and *artificial*. The first is the fine yellow mild alluvial clay found chiefly in the neighbourhood of London, and which contains a calcareous substance called *RACE*. In some cases this is in the form of a coarse powder, in others in nodules resembling sticks of ginger, from whence it has the names of *flowery race* or *ginger race*. The fine yellow colour of the best malm brick, is to be attributed to the presence of this substance; but this colour is only to be obtained by most carefully excluding the air during the process of burning. Where the atmosphere gets

access, the brick becomes red, has no external vitrification to turn off the weather, and is less hard: it is then called a *place* brick. The chemical cause of this change of colour is probably the conversion of the oxides of iron, so plentiful in almost all sorts of clay, into red peroxides. The cause of the bricks in the same clump being of such a rich yellow colour where the air has no access has not yet been explained chemically; it is supposed, however, that the iron, not obtaining enough oxygen during the combustion to become a peroxide, unites with the calcium, and assumes a yellow colour very much analogous to that of a chromate of iron.

The great demand for these bricks, and the scarcity of *natural* malm earth, induced some experiments to make an *artificial* malm earth. This, after many attempts, was perfected and patented about seventy years ago by an ancestor of the well known firm of brickmakers and builders Messrs. Lee. It consists in simply mixing a certain portion of chalk, seldom exceeding a sixth part, with common earth, a clay like the alluvial in other respects except in not containing any *race*. This mixture is effected by a process called washing.

Washing. It was found that any portions of calcareous matter, whether *race* or chalk, which might not be intimately dispersed through the clay, became lime during the process of burning, and when exposed to the air slacked and blew holes in the surface of the brick. To prevent this a contrivance was made consisting of a large circular pit, round which two horses walk, dragging after them two or more large harrows with strong iron teeth. A quantity of water being admitted, the clay is thoroughly disintegrated by the harrows and by the action of the water till it is of the consistence of cream. It is then allowed to run out into *backs* or square receptacles through iron gratings, which separate from it any stone there may chance to be in the earth; and it is then suffered to settle and dry to a consistency fit for moulding. In making *artificial malm* it is usual to wash the chalk first by itself, and after it is settled to mix it with the clay in the mill. The best wash mills are those in which the pumps are self-acting; the first of these was invented by the late Mr. Ashpitel, architect, and is figured in REES' *Cyclopædia*.

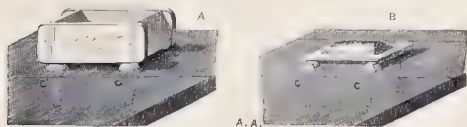
Common Earth has been already described under *Brick Earth*. That for bricks burnt in kilns is generally stronger and stiffer than for clump bricks. The former in fact are more of the character of tiles, and require similar earth (*POTTERY*; *TILE*). *Common Earth* is simply prepared by digging and throwing it up loosely into square heaps called *curfs* and exposing it to the action of weather and frost, by which it is disintegrated, and becomes *milder* or more plastic. By the old excise regulations all earth intended for bricks was to be turned over twice before the 25th of March in each year. Sometimes a portion of malm is washed on the top of a curf of common earth; this makes a brick called *half-washed*, if done to a sufficient extent. The next process, both for *malms* and *commons*, is mixing fine ashes with the earth; this is commonly called *soiling* and *turning*.

Soiling and Turning. The soil or ashes sifted through a fine sieve are wheeled to the top of the earth in the *curfs* or *backs*, which are first very carefully levelled. They are then trodden down so as to form a uniform layer, which is carefully gauged. This is the most important of all the operations in brickmaking, as half an inch more or less to the foot of earth will either fuse the bricks and run them together into huge lumps called *burrs*, or will cause them not to be burnt enough to acquire the vitrification on the surface, and the thorough molecular change in the fabric, so that they will remain *PLACE* bricks. With the same quantity of fuel also, a very dry season, or a continuance of wet cold weather, will cause the same changes. As much difference as from 1 inch to 4 inches of fuel to every foot in depth of earth in the *curf* has been used. No rule can be given. The quantity can only be ascertained by long and almost intuitive experience of the quality of earth and the vicissitudes of the seasons. It is for this last cause that old sailors generally make the best

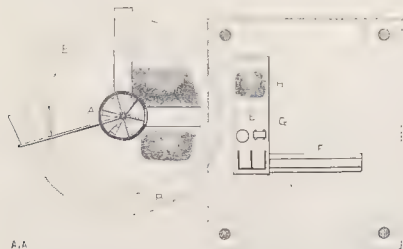
brickmakers. The soiling is always confided to the chief workman in the establishment, who is called the *setter*, and as the profits of the year are entirely dependent on his skill, he consequently earns very large wages. When the soiling is completed the mass is turned over with the shovel, the fuel being equally distributed, and the whole is ready for tempering.

Tempering. This is performed by again turning over as much earth at a time with the shovel as will be wanted in a day, and mixing it with a sufficient quantity of water; it is then chopped over with a large hoe and wheeled into the *pug mill*. This is a strong tub in the form of a portion of an inverted truncated cone, in the middle of which revolves a strong iron spindle set round with large horizontal knives, on the blades of which are other knives set vertically. This spindle is turned by a horse; the revolutions of the knives thoroughly mix the earth together and render it plastic. The top and bottom knives are set at an angle with the horizon, and are called *forcing knives*, as by their action the earth is compressed, and squeezed out through an orifice called the *pug-hole*. Here it is cut into convenient pieces by a boy with a sort of small circular spade called a *cuckold*, and carried to the moulder's table.

Mould. The brick mould is composed of two parts, the *mould* itself and the *stock*; the former is made of sheet iron ends, with oak sides, and is of such dimensions as will turn out a brick as near as possible nine inches long, allowance being made for shrinkage in drying and burning. This allowance of course can only be ascertained by experience; some moulds are made nearly ten inches long. The width is always



exactly half the length. A, is the *mould*; B, the *stock*, which is made of iron placed on a block of wood, on the stock there is always a rise or protuberance called the *kick*, forming a hollow in the under side of the brick to give a key to the mortar, and to enable the brick to *bed* better; on this part the maker usually puts his initials. c, c, are the *stock pins*, by which the thickness of the brick is regulated; they are wedge-shaped, and are driven into the table to the necessary height. The proper thickness of a brick, strange to say, is very little known. It should be exactly one-tenth of thrice the length of a brick $\approx \frac{3\frac{1}{2}}{10}$, or they will not *set* closely in the clamp. The *neck*, as will be explained under *Setting*, being always composed of courses of headers three in depth, and of stretchers ten in depth set on their edges. If the brick be nine inches long, the width is $4\frac{1}{2}$ inches, and the thickness $\frac{3\frac{1}{2} \times 9}{10}$ or $2\frac{7}{10}$ inches. The plan illustrates a moulder's workshop, often termed the *stool*, though strictly that term should be only applied to the table. This workshop is usually a shed supported on four posts with a rough thatched roof.



A, the pug mill, showing the cutting knives. B, the horse path. C, the temperer's wheel stage. D, the pug-hole, on each side of which are the spare earth beds. E, the moulder's table, with bins for the sand, the water bowl, and mould and stock. F, the page on which

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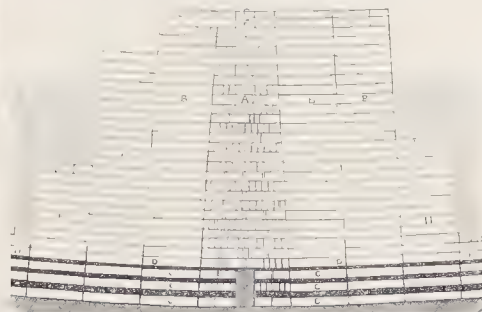
the bricks are placed when made, upon thin boards called *pallet boards*, from whence they are transferred to the off bearing barrow. o, the station of the moulder. u, that of the walk flatter. x, that of the barrow loader.

The largest brick manufactory in the world is that at Ingersdorf on the Wienerberg in Austria, described in the *Jurors' Reports of the Exhibition of Industry 1851*, p. 580, as producing $65\frac{1}{2}$ millions of bricks and tiles annually.

Moulding. To describe minutely all the processes of manufacture would be impossible. Suffice it to say, the requirements for good moulding are, making the bricks by equable pressure, so that all may shrink alike; filling in perfectly all corners, and facing the brick well with the *strike*; equal distribution of the sand, on which the semi-vitrification before mentioned so much depends; and delivering of the brick upon the *pallet boards* in a perfectly square form without *squabbing*. With all these requirements it seems wonderful that one man will frequently mould as many as 40,000 bricks a-week; and one in the employ of Messrs. Kilvington actually moulded the extraordinary number of 63,000 bricks in that time.

The bricks when moulded are conveyed by the *off-bearer* to the *hacks* to dry, and when sufficiently hard to be moved by the hand are *skintled*, or placed diagonally about $1\frac{1}{2}$ inches apart, so that the air may circulate around them and the drying be accelerated. When this has taken place perfectly, which is ascertained by breaking a brick and examining the inside, comes the important operation of *setting*.

Setting, or placing the bricks in the clamp. For this purpose a carefully bonded pile is first made, about five bricks wide at the bottom, diminished to three bricks at the top, both



sides *battering* alike; this is called the *upright*, A. Against this on each side bricks are piled up in what are called *necks*, B, or parallel piles of alternate courses of three headers, and ten stretchers. The piles when incomplete, as H, are called *arters*. At the bottom are some courses of burnt bricks, C, to keep the raw work from the ground, between which are two courses of breeze or coarse ashes, and one somewhat fine, called a *trimming course*, D. Under the upright, and every fourth or sixth neck, is a *lice-hole*, E, or opening like a square drain, filled with coals and wood, intended to expedite the combustion of the breeze. The *heads* or ends of the necks and uprights are built *battering*, the ground on which the whole stands being slightly hollowed out; the object of the entire arrangement being that each *neck* of bricks should sink or slide downwards against the face of the others as the breeze below becomes gradually consumed, so that the combustion should disperse itself equally through the whole mass without admitting the external air, which causes *grizzles* or grey bricks, *samel*, *samile* (salmon), *sandel*, or partially red bricks, and *place* or entirely red bricks.

It does not follow, however, because a brick is red on its surface, that it is unserviceable. Where there has been a deficiency of firing, and the burning has not been such as entirely to change the molecular structure of the brick, it will not bear

the weight it ought without crushing, and is strictly a *place* brick. Where there has been sufficient burning, and where the redness has been caused simply by the access of the air during the process, the brick is unfitted for external work, as it has not the semi-vitrification before described, and will not throw off the wet; but it will last as long, and be as serviceable on the inside of a wall, as a stock brick would on the outside.

The clamp is then cased with bricks already burnt, and called from their different positions the *bolt*, the *stowing*, and the *sneezing* bricks, and it is covered with two other courses of burnt bricks, called the *cantling*, *F*, and the *plattling*, *G*; fire is then set to the coals and wood of the live-hole, which communicate it to the breeze, and thence to the soil within the bricks, till the whole becomes one incandescent mass, of such heat that pieces of broken glass, which are often among the breeze, are generally melted by it. This heat is suffered to cool as gradually as possible, an operation which sometimes lasts six weeks. The clamp is then opened by pulling down the casing, and if the clamp be of *commons*, the place bricks are wheeled away and bolted up, leaving the stocks to be loaded directly into the carts. If a *malin* clamp, the whole is turned over and carefully sorted; the best of which (the soundest, squarest, mildest, and of brightest colour), are called *best malins* or *cutters*, and are used for gauged arches, etc.; those not quite so good are called *seconds*, and are generally used for house fronts. The same sort of brick if burnt a little harder, is called a *paver*, and if rather softer than it ought to be, and of pale colour, a *picking*; while those of red colour are called *malin place*. When the firing has been so strong as partly to fuse the bricks, so that they stick together in masses, they are called *burrs*; and where the rain has made its way in, or when the bricks have not been completely dry before burning, they are called *shuffs*. These are not only very soft, but the mass has lost its integration, and will shiver to pieces at a blow. The experiment has been made of putting a red-hot sound stock into water, when it has become a *shuff* and fallen into shivers at a touch. Frequent mistakes are made by the ignorant, who suppose the different faults of bricks are owing to a difference in the making; whereas all are moulded alike, and it is the accidents of the burning alone that make the difference.

Brick Burning by Direct Action of Flame. The earliest method was with wood. The earth chosen is generally tougher than that for London bricks. They are moulded in nearly the same way, but are commonly dried under long covered sheds or *hack-houses*. The kilns are of a square form, built of bricks, and generally covered at the top with a light roof; at the bottom of the kiln are burnt bricks or burnt earth called *horses* or *benches*, communicating with the furnace mouths, and forming flues for the passage of the heat; on these the raw bricks are set closely at the bottom, and less closely in the upper courses. Furnace-holes are made on one or more sides, which are supplied with faggots, the heat and flame from which ascend among the bricks, and are continued for forty, sixty, or eighty hours. The furnaces are then stopped with clay, and the whole kiln suffered to cool slowly. The best bricks are called *red rubbers* or *cutters*, the others *red stocks*. The cause of this redness and other general particulars have been given before. Of course in this and the following method there is no firing mixed with the clay of which the brick is formed.

Brick Burning—Dutch Method. The bricks, moulded and dried as before described, are placed in long rows surrounded by a casing of burnt bricks put up without mortar. At every four feet live-holes or furnace mouths communicate with channels much as already described; but the live-holes are blocked up in the middle and do not pass entirely through the kilns, so that the flame is thrown upwards: these furnace mouths are fed with pit coal for from seventy to a hundred hours. The rest of the process is the same as that described for the former method. An account of this Dutch method of brick and tile manufacture is given by HYDE CLARKE in vol. iii of WEALE'S *Papers on Engineering*, 4to., London, 1845.

Brick Burning—Scotch Method. A name lately given to a process something between the London and the Dutch methods. A small quantity of firing, about half an inch to a foot of earth in the curf, is mingled with the earth of which the brick is moulded; the process is then exactly that of the Dutch method, except that the feeding the furnaces is not continued for so long a time. The terms Dutch method and Scotch method are often confounded.

Brick Burning—French Method. This resembles the Dutch method, but is carried out to a much larger extent, and for reasons stated below has become of the greatest importance. The bricks when moulded are laid on a level piece of ground (*aire*) to be partly dried, they are then dressed (*parer la brique*) by a sort of mallet called a *batte*, then placed in hacks as in the other methods till quite dry. They are then set in long kilns. The three bottom courses are placed some distance apart, in the manner called in England "pigeon holes", and filled with small coal; these courses cross each other; the fourth is a course of headers; the fifth course alternately two headers on edge and two stretchers laid flat. It must be remembered that the French brick is thinner than the English; the former is the fourth part of its length, and of course the twelfth part of three bricks in length, while the English brick is the tenth part of the length of three bricks. The sixth course is a skintled course except where it crosses the top of the live-holes. These occur at the distance of every three feet, are in width the length of one brick at bottom, and reach in height from the ground to the upper side of the sixth course, the bricks corbelling over till the aperture is covered. These live-holes pass through the entire kiln, and form what are called *canals*; they are filled with large coals and wood, and are open at the extremities, but blocked up in the middle of the kiln. The seventh course is a course of headers, the eighth of stretchers. Fine coal is sometimes strewed through every course, and sometimes through only every other course. Vertical chimney openings connected with the *live-holes* rise through the whole. Around the live-holes a sort of furnace mouth called a *chapelle* is built, and large hurdles are provided as wind-screens. The live-holes are then ignited with considerable ceremony always preceded by prayer; and at the same time the chimneys are filled full of burning coals. The fire is then fed from eighteen to twenty hours, according to the state of the weather; when the second portion of the operation takes place, viz. the further raising of the kiln, "l'exhaussement définitif du four". After the expiration of the eighteen or twenty hours, the live-holes are stopped with raw bricks and plastered up with clay. A quantity of earth is then thrown up with spades so as to form a slope (*talus*) against the kiln and to keep in the heat; and other courses are placed from time to time on the kiln. The eighth course having been well strewn with small coal, a ninth course is placed on them composed of headers, as soon as the fire shows itself. Courses alternately of headers and stretchers follow, except that the sixteenth and twenty-fourth are skintled courses. The total height is usually twenty-eight courses. If any unequal settlements appear in the kilns, the setter brings the courses to a level by greater or less strewing of small coal, and sometimes by what are called false courses, which are courses of brick flat. If the fire be too weak, he strews more coal; if it appears too strong, he sometimes strews sand, with which also the top of the kiln is frequently covered. The outsides are then daubed with clay to prevent too great action of the air. After the kiln has cooled thoroughly, it is opened and the bricks loaded into carts. It takes ten days to set a kiln of 200,000 bricks, and twelve to fifteen days after the *exhaussement* to burn them thoroughly—about one-third of the time it would take to burn the same number in the London clamp fashion. Of course times and quantities will also vary with the quality of the coal.

It is very often of the greatest consequence to get bricks as early as possible. It also very often happens (particularly in

engineering works) that bricks must be made at a great distance from any city, and consequently where cinder ashes cannot be had, but where coal can be readily procured. It is for these reasons the Dutch and French methods have come into use; they are as yet but imperfectly understood, but are daily growing into the greatest importance.

On the subject of the London system of brick making no work has yet been written which can at all be relied on, but access can readily be had to the different establishments in the neighbourhood of the metropolis. An excellent work on the French system has been published by the principal engineer of the French Royal Corps des Mines, CLERE, *Essai Pratique sur l'Art du Briquetier*, etc., dans le Département du Nord et dans la Belgique, etc., 8vo., Paris, 1828. As the technicalities both of English and French workmen are unusual in Dictionaries, a short glossary of English terms is given, with such equivalents in French as apply to the foreign system.

Brick earth	Terre à brique.
Strong or bunky earth	Terre forte.
Rich ditto	Terre grasse.
Hungry or sandy ditto	Terre maigre.
Race	Tuf.
Preparing	Préparation.
Curf. The earth when in heaps	Le banc de terre.
Turning. Explained above	Fouillage et démolage.
Grafting tool. A spade with curved blade	Bêche.
Temperers. The workmen who water the earth and mix it ready for the moulders	Batteurs, brouetteurs, démolisseurs.
Scoop. A sort of wooden spade for throwing on the water	Épave.
Mould. Explained above	Moule.
Moulder. The workman who forms the brick	Mouleur.
Strike. A piece of thin wood, about a foot long and three inches wide, to smooth the face of the brick. In France they are of various forms	Plane.
Stool. The shed under which the moulder works, etc., but more strictly the table on which he works	Selle.
Bowl. In which the water is put to moisten the mould and make the sand adhere to it	Petit seau.
Bin. Place for the dry sand	Minette.
Mould knife. To cleanse the mould from time to time	Ratissette.
Upstriker or pug boy. The boy who conveys the earth from the temperer or pug mill to the moulder's table	Apprêteur.
Walk flatter. Boy who cuts off a portion of this earth and rolls it into a rough form called a walk, ready for the moulder to throw into the mould. The French workmen have two moulds, which are wetted and sanded by boys or women, and used alternately. These last are called by M. Clere	Porteurs or Apprentis.
Pallet boards. Thin boards on which the bricks are deposited previously to conveying them to the hacks. The French system, as has been explained, is different.	
Page. A long narrow board with two parallel pieces of iron, on which the bricks are slid along before they are put on the off-bearing barrow, which is a long barrow formed of laths, and capable of holding twenty-five bricks	
Obbearer, properly Off-bearer, who places the bricks in rows	Metteur en haie.
Hacks. Rows of bricks, generally double	Haie.
Blade. Half or one side of a hack. In the London system the bricks on the hacks are protected from rain by straw, the kilns by hurdles or boards	Haie simple.
Hurdles. A sort of moveable thatch of reeds tied on to frames of sticks. In France they are often of straw	Paillassons.
Hack houses. Permanent sheds are sometimes in the old system built to protect the hacks, and are called in French	Hangars.
Kiln. Properly a brick furnace for burning bricks with wood	Four.
Clamp. A body of bricks piled up together for burning either in the London, Dutch, or French systems; but clamps are often called kilns	Enfourne.
Setter. The workman who piles up the bricks for burning	Enfourneur.

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Crowders. Men who convey the bricks from the hacks on crowding barrows to the clamps	Rechercheurs.
Headers. Bricks set with their heads outwards	Boutisses.
Stretchers. Bricks set with their sides outwards	Panneresses.
Skinlers. Bricks set anglewise, and generally a little way apart	Briques en épérons.
If set on end	Élampées.
Pigeon holes. Bricks set parallel and at right angles to the faces of the kiln, but at some distance apart, so that the interstices may be filled with breeze or small coal	Clair-champs.
Raw bricks	Briques crues.
Burnt bricks	Briques cuites.
Small coals	Charbon menu.
Large coals	Guyettes, ou galliettes.
Breeze basket. Wicker basket from which either breeze or small coal is strewn	Mantellete.
Live-holes. Before described	Foyer.
The course of the live-hole is called	Canal.
Some bricks built up in front like a furnace mouth	Chapelle.
Courses. Rows of bricks not close together in kiln or clamp	Lit.
If close	Tas.
A flat course	Faux tas.

Besides the works already named, see BAKEWELL, *Observations on Building and Brickmaking*, 12mo., Manchester, 1834; WEDEKE and ROMBERG, *Die Baumaterialienlehre*, etc., 4to., Leipzig; DOBSON, *Rudimentary Treatise on the Manufacture of Bricks*, etc., 12mo., London, 1850; RONDELET, *Traité Théorique*, 10th edit., 4to., Paris, 1852, and *Supp.* by BLOUET, 1852; ECK, *Traité de Construction en Poteries*, etc., fol., Paris, 1836; DELONGE, *Art de Briquetier*; SIMMS, *Account of Brickmaking at Bletchingley Tunnel, 1840-1841*, given in *CIVIL ENGINEER Journal*, vi, 348. A manuscript *Essay on Bricks*, etc., by S. J. Nicholl, 1845-6, is in the library of the Royal Institute of British Architects.

A. A.

BRICK, ABSORPTION BY. The actual absorption of water by bricks of various qualities is thus stated:

One malm place brick absorbs	62 ounces of water.
„ White Surrey „ „	58 „
„ White second „ „	52 „
„ Red facing „ „	51 „
„ Picking „ „	50 „
„ Stock „ „	27 „
„ of Workman's waterproofed	2 „

BRICK, SIZE OF, ancient and modern (in inches).

	Long	Wide	Thick
Babylonian, in British Museum	12 1/2	8 1/2	3 1/2
Egyptian (Thothmes 3)	15 1/2	7	6
Ditto (Amenoph 3)	11 1/2	6	4
Ditto „	12 1/2	6	4 1/2
Ditto pyramid at Illahoon	16 1/2	8 1/2	5 1/2
Ditto „ Dashhour (northern)	16	8	4 1/2 to 5 1/2
Ditto „ „ (southern)	15 1/2 to 13 1/2	7 1/2 to 6 1/2	5 1/2 to 4 1/2
Grecian, pentadaxon or 5 palms, about	11 1/2	14 1/2	1 1/2
Ditto, tetradaxon or 4 palms, about	11 1/2	11 1/2	1 1/2
Roman, didoron	12	6	—
Ditto, at Pompeii	—	—	2
Ditto, Baths of Titus	8 1/2	5	1 1/2
Ditto, Palace of the Cæsars	23	—	1 1/2
Ditto, Tor dei Schiavi (used as bond courses)	2 1/2	13 1/2	1 1/2
Ditto „ „ (arch tiles)	18	6	1 1/2
Ditto, Sta. Maria in Cosmedin (temp. Tiberius)	1 1/2	8 1/2	1 1/2
Ditto, Villa of Tiberius at Capri	25 and 27 to 30	9	2 1/2
Ditto, S. Alban's	—	12	1 1/2
Ditto, London wall	17 1/2	11	1 1/2
Ditto, Toulouse	11	9	1
Ditto, smaller bricks or tiles	7	7	1 to 1 1/2
Chinese (of a blue tint) common	16	1	2
Ditto in the Great Wall	17	7	1
Austrian	11 1/2	5 1/2	2 1/2
Ditto at Pesth (1830)	12	6	2 1/2
Dutch, house bricks	11 1/2	4 1/2	2 1/2
French, in Languedoc in 13, 14, & 15th centuries	13	10	2 1/2
Ditto, in the Bourbonnais, 15th century	9 1/2	14	1 1/2
Ditto, „ „ 8 x 4 x 2 Fr. ins. or 8 1/2	—	11	2 1/2
English at Little Wenham, 1260 or 1280	9 1/2	11	2 1/2

0 0

English (<i>temp.</i> Edward II) 1310	12	6	3
Ditto called 'great brick' 1734	10	5	2
Ditto " 'small' or 'statute', 1734	12	6	3
Ditto 'stock', 18th century	9	4½	2½
Ditto 'stock', 19th century	9	4½	2½
	8½	4½	2½

BRICK, STRENGTH OF. Experiments upon this material are so seldom made, that the following list, compiled from various authorities, will be useful:

Quality.	Pressure per square inch.	Pressure on the whole	Remarks etc.
Of Huntingdonshire clay, perforated	31	1388 cwt.	Broke in the middle but not crushed. BUILDER, xi, 78.
Suffolk clay, solid	8½	16 12	Ditto.
Made by Prosser's machine, bore	90	0	CIVIL ENG. vi, 340.
An ordinary stock	140	0	
A good one, in the kiln	157	0	On square foot.
A brick used at Edinburgh Gas Works, of a mixture of fire clay and iron stone	400	0	Ditto, xi, 125.

The following experiments were made by Mr. Thomas Cubitt on bricks of his own manufacture (BUILDER, v, 537):

Quality.	Yielded to	Crushed by	Remarks, etc.
A good place brick	11	14½	Faced with plaster to make an even bed.
A ditto	16	20	
Two common stock bricks (?)	10	16	Not plastered.
A good stock	31	54	
A superior, double stock	36	44	

A pressed and kiln-burnt stock made for superior purposes, ground on both faces to get a true bed, bore 60 tons, the limit of the ram used, and was uninjured.

A ditto, plastered as above but not ground, resisted the same pressure without crushing, but was slightly broken at the edges.

A bat of the same description with a somewhat uneven bed, not faced, was crushed by 27 tons.

The hollow formed on the underside of a brick necessarily lessens its resisting power.

Quality.	Yielded to	Crushed by	Remarks, etc.
An ordinary place brick from another field	11	14½	
A second ditto	16	20	

A brick made by Messrs. Beale's machine, being placed on bearers 7 inches apart, was broken in the middle by the application of 2,625 lbs. A common hand-made brick was broken by 645 lbs. *ATHENÆUM Journal*, 1854, p. 1531; 1855, p. 55. The cohesive strength of a square inch of brick is 300 lbs.; *YOUNG, Nat. Phil.*, i, 151.

Experiments made by W. T. Clarke, Esq. v. p. 42, 5. appl. to WEAL'S Bridges, 1832.	Weight of an English brick.	Began to fracture weight of	Crushing weight.
	Dry	Wet	
The brick used in the erection of the suspension bridge at Pesth, 1830	1	60-82	81-28
45, made by Steinberger of Pesth, size 12 by 6 by 2½ inches	2	73-41	81-1

Strength of brick piers 9 inches square, 2 feet 3 inches high, made of good sound Cowley stocks set in cement, proved two days afterwards:

	Cracked at	Broke at	
Brick flat, compressed a quarter of an inch	25 tons	30 tons	BUILDER, vi.
Brick on edge, did not compress	30	35	62, 177.

To crush a mass of solid brickwork 1 foot square, requires 300,000 lbs. *avoirdupois*. *GWILT, Encyc.*

To crush a block of 1½ inches cube of red brick, requires 1,817 lbs. *TEMPLETON, Pocket Book*.

See also the experiments detailed under BRICK BEAM.

BRICK AND BRICKWORK, WEIGHT OF.

	Long.	W. je.	Thick.	Weight, about.
'Great brick' in use in England about 1734	12 in.	6 in.	3 in.	15 lb.
'Small' or 'statute brick', ditto	9	4½	2½	5
Place and stock of present day	9	4½	2½	5
Cowley stocks	9	4½	2½	5
Hunt's machine-made bricks	9	4½	2½	5

330 well burnt bricks average 20 cwt., so that a cubic foot weighs about 125 lbs. *GWILT, Encyc.*

One brick weighs nearly 9 lbs. *avoir.*; 12½ bricks=1 cwt., and 250 bricks=1 ton: *TEMPLETON, Pocket Book*.

A cubic yard of brickwork has been computed thus:

	ton.	cwt.	qrs.	lbs.	ton.	cwt.	qrs.	lbs.
384 dry bricks	1	2	1	20	1	2	1	20
Sand, water, and cement	0	6	2	4	0	6	2	4
	1	8	3	24	1	8	3	0

CIVIL ENG. viii, 110.

The weight of a rod of brickwork in mortar is calculated at

	ton.	cwt.	qrs.	lbs.
1,500 bricks	9	18	0	9
81 cubic feet of sand	3	8	3	20
40 feet 0 inches of chalk lime	2	0	2	0
	15	7	2	1

or, as given by another writer:

	ton.	cwt.	qrs.	lbs.
1,500 bricks, at 4 lbs. each	10	0	3	10
304 cubic feet of lime	1	10	2	0
914 cubic feet of sand	3	17	3	12
	15	11	1	0

The weight of a rod of brickwork in Roman cement is composed of

	ton.	cwt.	qrs.	lbs.
Bricks	10	0	3	10
Cement 56 bushels at 4½ lbs. per bushel	1	3	1	24
Sand 30 bsh., 40 2-7ths cubic feet, or 95½ lbs. per cubic foot	1	19	1	16
	13	3	3	0

If in Portland cement, 1 part being used to 3 of sand

	ton.	cwt.	qrs.	lbs.
Bricks	10	0	3	10
Cement 18 bushels, at 1 cwt. per bushel	0	18	0	0
Sand 54 bsh., 60 3-7ths cubic feet, or 95½ lbs. per cubic foot	2	19	0	10
	13	17	3	20

Dry brick weighs per cubic foot

Brickwork in mortar, ditto

Roman cement, ditto

Portland cement, ditto

DEMPSEY, *Builder's Guide*.

A foot superficial of brickwork without mortar	Thickness of brick.	Number of bricks.	Weight in lbs. <i>avoir.</i>
	1 or 1½ ins	458	40-19
	1	92	80-57
	1½	144	13-72
	2	184	18-3
	2½	224	22-575

BRICK ARCH. During late years arches of brick or of tile have been extensively introduced in the construction of FIRE-PROOF FLOORING. *FAIRBAIRN, On the Application of Iron to Building Purposes*, 8vo., London, 1854, p. 133, states "the floors of buildings, when formed of brick arches, require consideration in regard not only to the weight of the material, but also to the nature of the arches, and the lateral thrust which they exert upon the sides of the beams and the gable-walls upon which they abut. In mills for the manufacture of cotton, silk, flax, and wool, the span of the arches varies from 9 to 10, and sometimes to as much as 11 feet. These arches are generally composed of the segment of a circle, with a rise or versed sine in the top of about one-twelfth of the length of the chord. One-tenth, however, is safer in practice for mills, and one-eighth for warehouses where heavy goods are stored. These proportions will vary, however, according to circumstances, the nature of the strains, and the uses for which the building is intended". These remarks are accompanied by an illustration and an explanation of the necessity and proper position of TIE-RODS or TIE-BARS.

The following are the results of Mr. Thomas Cubitt's experiments, laid before the Institution of Civil Engineers, May 11, 1841: "Two arches were built, each with a span of 15 feet 9 inches and a rise of 2 feet. The brick arch was 2 feet wide, half a brick thick in cement. The tile arch was 2 feet 4 inches wide, four tiles in cement and 4½ inches thick. The span-drills were filled up level to the crown with rubble work and cement. A load of dry bricks was placed along the centre of

both arches, and gradually increased at stated periods from 12 cwt. 3 qrs. up to 160 cwt. at the end of seventy-five days, when the abutments of the brick arch gave way, and the tile arch broke down while loading. From the circumstance of there being no tie-bars, the experiments cannot be considered satisfactory; they are valuable, however, as supplying data hitherto rarely recorded." *CIVIL ENGINEER Journal*, iv, 393.

A description of the half-brick arches used by C. E. Lang for floors in the dwellings for workmen at Birkenhead, is given in *BUILDER Journal*, vii, 212. A description and section of the arch at S. George's hall, Liverpool, formed of hollow bricks 12 inches long by 4 inches square, with a longitudinal perforation of 2 inches diameter, is given in the *BUILDER Journal*, vii, 184-6, and 198.

BLONDEL in his *Cours*, and after him RONDELET, state that very flat arched floors, composed of bricks cemented with gypsum, have been in common use in Roussillon from time immemorial, and that similar arches have in some few cases been executed at Paris by workmen from that district. RONDELET considers the segment of a circle a better form than the elliptic for such arches. They describe the construction of the War Office at Versailles, and of the stables of the marshal de Belle Isle at Bisy near Vernon. They also describe some very light pointed roofs formed with similar materials; and the latter considers it better to use coved arches for floors springing from four walls, than a common arch springing from two opposite walls only; PASLEY, *Outline of a Course of Practical Architecture*, etc., 4to. (lithographed), Chatham, 1826, p. 177.

Pointed arches in brickwork for the roof and other portions at Maidstone gaol, erected in 1810-17, will be found noticed in the biography of D. A. Alexander.

Semicircular or segmental arches up to 12 feet span, whose rise is not less than one-fifth of their span, may be built of one brick or 9 inches thick: from 12 to 20 feet span they should be 1½ brick or 13½ inches thick; from 20 to 25 feet, 2 bricks or 18 inches; and from 25 to 30 feet, 2½ bricks or 1 foot 10½ inches. They should be executed in half-brick rings or rims; and it is generally recommended that they be worked wholly in cement, especially when exposed to the weather during construction; but where settlements are likely to occur, as when work is done hastily, good mortar is perhaps preferable. Wherever it will work in, a header should be introduced vertically, to bond the two or more adjoining rings together. Care is of course required in striking the centering of these as well as of other arches. **BRICK BEAM**; **BRICK BRIDGE**; **GAUGED WORK**; **OBLIQUE or SKEW ARCH**; **FLAT or STRAIGHT ARCH**.

BRICK AXE. A tool with two chisel-shaped ends, used by bricklayers for cutting bricks for gauged arches. The lines having been first marked on the brick by a species of small saw, the axe is taken by the middle and held in a perpendicular position; its edge is then applied to the brick where marked, and both being raised together it is struck smartly on a block of wood, by which the brick is cut into shape. The rough edges of the brick are then rubbed on a piece of grit stone. **GAUGED WORK.**



A. A.

BRICK BAT, see **BAT.**

BRICK BEAM. A species of lintel formed of several courses of bricks laid in cement, with layers of iron hooping between each. The soffit is nearly flat, and the beam in fact resembles a lintel of solid stone. There is no scientific principle about this mode of construction. It depends solely on the cohesion of the cement and the tension of the iron.

A. A.

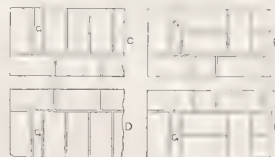
BRICK BEAM, BRUNEL'S. A method invented by Sir Mark Brunel for constructing a species of arch or bridge of large span, where there is a difficulty in fixing centering. It was constructed of bricks in cement, each course corbelling or projecting over the other, and like common brick beams, with a quantity of iron hooping between each. It was thought

ARCH. PUB. SOC.

by carrying out this system on both sides of a river at once, till the extremities met in the centre, an arch would be formed without centering, which when completed would be firm and durable; but the leverage was so great before the two ends came in contact, it was found the scheme could only be carried out in small spans, and at great expense. Illustrations and experiments in 1837-8 will be found detailed in the *CIVIL ENGINEER Journal*, i, 119. Other experiments on brick beams in cement and mortar with iron hooping, made at the Royal Engineers' establishment at Chatham, will be found at page 30; of Messrs. Francis and Son's beams of brick and Roman cement at pages 45, 102, and 135; and of Messrs. J. B. White's beam of hollow bricks and Portland cement in xiv, 510, and xv, 198; also *BUILDER Journal*, ix, 603; *ILLUSTRATED LONDON NEWS*, xix, 584; and *JURORS' Reports on the Exhibition of Industry*, 587. Various experiments are described in WHITE, *On Cementitious Architecture*, etc., 8vo., London, 1832.

A. A.

BRICK BOND. Ordinary brickwork is carried up in courses, the bricks of which are laid after two methods, called English bond and Flemish bond. *HOSKING, Building in the Enc. Metrop.*, says, p. 76, "English bond should have the preference



English bond
C, D, upper and lower courses;
O, G, closers.

when the greatest degree of strength and compactness is considered of the highest importance, because it affords a better transverse tie than the Flemish bond, and transverse tie is even more important than longitudinal."

This, however, is not the case where the walls are 18 inches thick; it is too often the case in English bond that walls are

carried up as two nine-inch walls side by side, the bricklayer not giving himself the trouble to make the transverse tie in the centre. In the case of a warehouse in Wood-street, a serious accident occurred by the splitting of a two-brick wall in this way. Such an accident is not so likely to occur in Flemish bond.

A. A.

In thick walls it is usual to introduce another variety of bond called *herringbone*, formed by a course of stretchers at each face, filled in with bricks laid diagonally; the wall is then continued again for another height, and then a course of bricks laid diagonally the reverse of the previous one, and the operation is repeated at another height. For description of other and inferior bonds, see *FLYING, HEADING, DIAGONAL, BOND*, etc.

SAUNDERS, *Observations on Brick Bond*, etc., 8vo., London, 1805, reprinted in vol. i of the *CIVIL ENGINEER*, etc., *Journal*; *ELMES, Foundations*, in *ARCHITECTURAL SOCIETY'S Essays*, p. 181; *CLEGG*, in *CIVIL ENGINEER Journal*, xv, 206; *DEMPEY, Builder's Guide*, 8vo., London, 1852. The subject is most fully considered by PASLEY, *Outline of a Course of Practical Architecture*, etc., 4to. (lithographed), Chatham, 1826, p. 47, et seq. and 205-7, a copy of which is in the library of the Royal Institute of British Architects.

The term is applied to courses of bricks, sometimes with hoop iron between them, introduced as a tie in flint or rubble work. They are of Roman origin, and may seen in almost all the remains of Roman rubble work. They not only act so as to prevent settlement by tension, but they bring the rubble work to frequent level beds, and thus equalize the pressure of the whole wall. In flint work they are generally called "*lacing courses*". In ordinary brickwork it is sometimes very desirable to introduce bond-courses of brick in cement, with iron hooping tarred and sanded between each course, in place of bond timber. **BOND.**

A. A.

BRICK BRIDGE. Few bridges of large span have been erected with this material. The following being above 100 feet in span may, however, be mentioned: Crespano near Treviso in Italy (*BAUZEITUNG*, ser. 1, pl. 89); Maidenhead in Berkshire (SIMMS, *Public Works*, pl. 57-8); Toulouse and Carbonne, both in France, with portions of stone (GAUTHEY, *De la Construction des Ponts*, pl. vii, fig. 116; pl. x, fig. 160). The Tauk Kesra at Ctosphon, about eighteen or twenty miles from Bagdad, is one of the largest ancient brick vaults existing; it is a semi-circle 85 feet wide, 106 feet high, and 150 feet long; the bricks used are 1 foot square and 3 inches thick; IVES, *Voyage*, etc., 4to., London, 1773, p. 289. Brick has been more constantly used of late years in the erection of bridges of small span for railways, and most publications relating to such constructions contain examples; DEMPSEY, *Brick Bridges*, 4to. and fol., London, 1850 (30 feet span); HASKOLL, *Assistant Engineers' Railway Guide*, p. 145, part 2, 8vo., London, 1848. See also BRIDGE; OBLIQUE AND SKEW BRIDGE; STONE BRIDGE.

BRICK CLAMP, see BRICK, MANUFACTURE OF.

BRICK CONSTRUCTION. Among the few publications devoted to this subject are RUNGE, *Essais sur les Constructions en Briques en Italie*, fol., Berlin, 1849; LYTTLETON, *On the Antiquity of Brick Buildings in England*, *ARCHÆOLOGIA*, i, 140; BAGFORD, *Remarks on Brick Buildings in England*, *ARCHÆOLOGIA*, i, 148, 1770; WEBSTER, *Roman Bricks compared with the Modern*, *ARCHÆOLOGIA*, ii, 184; ESSEX, *On Brick and Stone Buildings in England*, *ARCHÆOLOGIA*, iv, 73; FOWLER, *Medieval Brick Buildings in the North-East of Germany, and on the Coast of the Baltic*, Paper read at the ROYAL INSTITUTE OF BRITISH ARCHITECTS, 18 February 1850; VIOLLET LE DUC, *Dict.*, s. v. *Brique*, etc. HOLLOW BRICK.

BRICK-DUST MORTAR. A species of mortar used by the Romans and lately reintroduced, in which ground brick rubbish is mixed with rich lime and sharp sand. It forms a sort of slow-setting hydraulic cement or inferior POZZOLANO. The best kind, which is generally called "Burnell's", is composed of one part of burnt earth or brick rubbish, one of coal cinder ashes, two parts of sharp sand, and about one and a half part (according to quality) of stone lime.

A. A.

Brick-dust mortar may be usefully employed in fresh water. In salt water a decomposition of such artificial pozzolano mortars takes place; it is possible that they may resist this action for even five or six years, but in all cases where they have been used under sea water they have always ultimately disintegrated. The first trial upon a large scale of this brick-dust mortar made of late years, was in the execution of some canal locks under the direction of M. Raffineau de Lille; it succeeded in this instance. M. Vicat recommended that the artificial pozzolano thus obtained should be used at Algiers, Cherbourg, the Ile de Rhé, and St. Malo; in all these cases it failed. At Rouen and in Normandy generally, tile shreds or soft red bricks ground, are largely used under the name of *ciment de tuileau*, for rendering cesspools, dungpits, tanks, basements of houses, etc. At Havre the price for fine-ground cement of this kind is 26 francs, and coarse-ground 18 francs per cube metre. LIME. G. R. B.

LANGLEY, *Prices of Bricklayers' Work*, etc., 2nd edit., 8vo., London, 1750, p. 43, says brick-dust mortar is exceedingly good, and in some cases better than Tarras, unless the latter is always wet; he recommends two parts of hot lime to one part of brick-dust made from red stock bricks; as is excellent for laying foot tiles (not glazed) in floors which are naturally damp; and at p. 125 he states that the rubbish of old walling ground and sifted fine and mixed with lime may be safely used even in frosty weather, as the rubbish imbibes water better than sand, and is therefore less likely to swell in a thaw and destroy the face of the work.

WHITE, in the *Quarterly Journal of Science*, xxxix, art. 8, records experiments of a similar mortar having lime to a quarter of the whole quantity, which required 23 tons to crack a wall, and 50 tons to crush a foot superficial. A bedding or joint of

the cement was not destructible by a weight of 173½ tons, which is just sufficient to split the best Portland stone.

BRICK FENDER. Dwarf walls resting on the ground and supporting the hearth slabs in the lowest stories of houses.

BRICK TRIMMER.

A. A.

BRICK FLOOR. A floor paved with brick. In England their use is confined to very inferior floors, and the bricks are generally laid on the earth. On the continent brick or tile floors are very often found in the upper stories. The brick is generally laid flat or on edge, disposed so as to break joint, and bedded either in mortar or in sand. Sometimes the bricks are disposed diagonally, or HERRINGBONE fashion. **TILE FLOOR.**

BRICK ARCH. FIREPROOF FLOOR.

A. A.

BRICK KILN, see BRICK, MANUFACTURE OF. Kilns will be found represented in ROMBERG, *Die Baumateriellehre*, etc., 4to., Leipzig. One for burning 400,000 bricks at once is given in the *Mémoires* of the Academy of Sciences of France. They are sometimes conical or domed; some are square, built with brick piers and covered with tiles. A kiln 18 feet long, 10 feet 6 inches wide, and 12 feet high, will burn 18,000 bricks at a time. The walls are 14 inches thick, and incline inwards towards the top.

BRICKLAYER. The workman who builds of brick. In countries where stone abounds, the trades of bricklayer and stonemason are often carried on by the same persons, who are indiscriminately termed masons, in Italy, *muratori*. With the exception of cutting gauged arches and groin points, it would appear that the trade of a bricklayer is a very simple one, and that the only knowledge required is that of a few bonds. It is surprising, however, how few really good and quick workmen are to be found: it requires a very quick eye and hand to bed the bricks so that the joints may be close and even, and to lay them so that the face of the work may always be plumb and out of winding. The use of compo has acted very detrimentally on the art of bricklaying. The bricklayer is always attended by an assistant called a 'labourer'. The trade of a bricklayer has always included TILING, and formerly not only SLATING, but even internal PLASTERING.

A. A.

A description of the working of bricklayers in India is given in the *BUILDER Journal*, ix, 439; at Canton in the *Detached Essay CHINESE ARCHITECTURE*; and a short history of the trade in England in *BUILDER Journal*, xii, 341.

BRICKLAYERS' TOOLS. They consist of a *trowel*, two or three smaller ones for pointing, a *hammer*, a *plumb-rule* and *bob*, a *level*, a *line* and a pair of *pins*, a 5 or 10 feet *rod*, a large and a smaller *square*, a *jointing rule*, two or three *jointers* for joints of different sizes, *compasses*, a *raker*, a *hod* for mortar, a *rammer*, a *crozebar*, a *pickaxe*, and a *grindstone*. For GAUGED WORK, a *banker*, a *camber-slip*, a *rubbing-stone*, a *bedding stone*, a *square*, a *bevel*, a *mould*, a *scribe*, a *tinsaw*, a *brick axe*, a *templet*, a *chopping block*, and a *float-stone*.

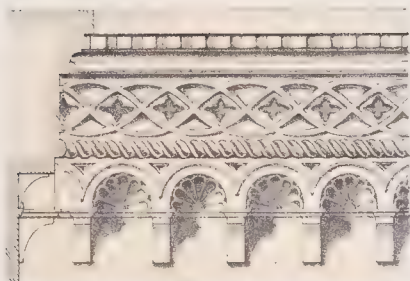
A. A.

LANGLEY, *The London Prices of Bricklayers' Materials and Works*, etc., 2nd edit., 8vo., London, 1750; MOXON, *Mechanick Exercises; Bricklaying*, etc., 8vo., London, 1682, 3rd edit., 1703; MARTIN, *New Circle of the Mechanical Arts*, 4to., London, 1815; NICHOLSON, *Arch. Dict.*, 4to., London, 1819.

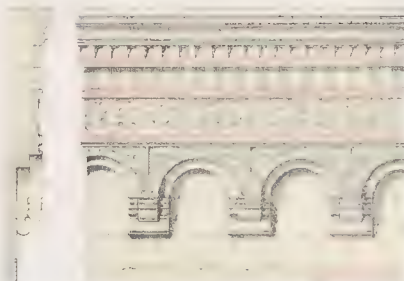
BRICK MAKING, see BRICK, MANUFACTURE OF.

BRICK-NOGGING. A method of filling-in with brick-work between the *quarters* of a partition placed at a distance of about 3 feet apart; forming a construction much superior to ordinary lathing and plastering in point of soundness, as well as more fire-proof. Ordinary partitions, with quarters one foot or more apart, are sometimes brick-nogged. The bricks are generally laid flat and as stretchers, making the unplastered partition 4½ inches thick, but where space is an object they are sometimes laid on edge. To make brick-nogging sound, rough pieces of wood about 1½ inches thick, called *nogging pieces*, are introduced about every 3 feet in height, driven down as hard as possible on the green brickwork, and touch or skew nailed to the quarters. Brick-nogging cannot well be

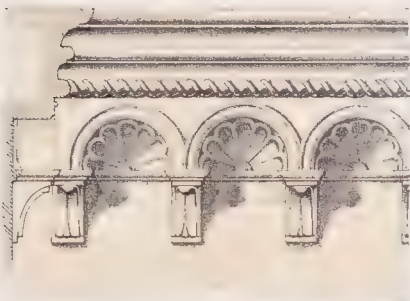
BRICKWORK.



BOLOGNA



BASILICA OF SAN VITALE



PADUA Cloister of S. Antonio



Redford 141

VENICE S. Gregorio

1345 and 6 W. Lightly



VENICE



BRICKWORK *View from the interior, Brickwork and Terra Cotta*



VERAICA
*Decorative Chimney Shaft
 by Howard M.B.A.*



See Standard M.B.A.

MILAN Ospedale Maggiore (Ant. Blares, Archt. 1857, 1858)

C. PALLA Campanile of S. Antonio



used where there is not sufficient support for it. One of the chief defects in modern brick-nogging is that the spaces, A, between the joists are often not filled in solid, so that sound is transmitted, and fire can readily pass. Thirty bricks on edge, and forty-five bricks flat, are used in one yard superficial of brick-nogging. In brick-nogged partitions the lathing is generally saved, but the timbers, which may be perhaps 4 inches wide, should be studded with lath nails to afford a key to the first coat of plaster. A. A.

BRICK RED. The term adopted by ANSTED, *Elementary Course*, 8vo., London, 1850, for a colour of which stillite and porcelain Jasper form the standard.

BRICK TRIMMER. A term applied to an almost flat half-brick arch, A, intended to carry a stone or marble hearth, D, on upper stories, as a BRICK FENDER does on the lowest ones. It is sprung from the wood trimmer, B, to the chimney breast, and is generally a little bent at the ends, whence it receives the name of a cushion trimmer, or as it is called in the old books a "coaching-head" trimmer. A. A.

A skew fillet or springing piece is fastened to the trimmer from which the arch springs, and sometimes an iron tie-rod is inserted from the bottom of the trimmer into the brick wall, to prevent the trimmer spreading out. The spandrels above the arch are filled in with mortar or fine rubbish to form a bed for the hearth.

BRICKWORK. The following memoranda are often required:—

A rod of brickwork ($16\frac{1}{2} \times 16\frac{1}{2} = 272\frac{1}{4}$ feet) is always taken at 272 superficial feet; and $1\frac{1}{2}$ bricks or $13\frac{1}{2}$ inches thick, is called in London the standard thickness to which all brickwork of whatever thickness is reduced. 15 or 16 bricks according to their size are required for a foot of reduced brickwork. Engineering works are generally measured by the cube yard.

4,352 stock bricks are required for 1 rod reduced, four courses to 1 foot high; 4,533 ditto, ditto, four courses to $11\frac{1}{2}$ inches high. These are without waste, and without deducting the space occupied by flues and bond timbers. 5,371 bricks laid dry = 1 rod; for which 4,900 bricks are required in wells and circular cesspools.

A rod of brickwork containing 235 feet cube of bricks, being 4,500 bricks, allowing for waste, and 71 feet of mortar at four courses to a foot, equals 306 cubic feet or $11\frac{1}{2}$ yards. A rod of brickwork requires $1\frac{1}{2}$ cubic yards or 27 bushels of chalk lime, and 3 single loads or yards of drift; or $30\frac{1}{2}$ cubic feet of lime and $91\frac{1}{2}$ cubic feet of sand; or $37\frac{1}{2}$ striked bushels of lime and 66 striked bushels of sand; or one cubic yard or 18 bushels of stone lime, and $3\frac{1}{2}$ single loads of sand; or 36 bushels of cement, and 36 bushels of sand.

7 bricks are required for a foot superficial of facing; 10 for gauged arches. 1,000 bricks stacked occupy about 56 cubic feet; 1,000 old bricks cleaned, about 72 feet. 30 bricks on edge, and 45 bricks laid flat = 1 yard of brick-nogging. A yard superficial of the standard thickness requires about $2\frac{1}{4}$ bushels of cement; of pointing to brickwork, one-eighth of a bushel.

A load of mortar, 27 feet cube, requires 9 bushels of lime and 1 cubic yard of sand; a hod contains 1,296 inches, and will hold 20 bricks, or a thirty-sixth part of a load of mortar, but is stated at a twenty-seventh part in price books. Lime and sand, and cement and sand, lose one-third of their bulk when made up. Lime or cement and sand require water equal to one-third of their bulk, or about $5\frac{1}{2}$ barrels to a rod of brickwork built with mortar.

ARCH. PUB. SOC.

When large masses of brickwork are measured by the cube foot, this measurement has to be reduced to the standard thickness by multiplying the quantity by 8 (the number of $1\frac{1}{2}$ inches in a foot), and dividing by 9 (the number of $1\frac{1}{2}$ inches in a brick and a half, or $13\frac{1}{2}$ inches.)

In common walling a bricklayer and labourer will lay about 1,000 bricks in a day of ten hours; a good workman about 1,500. With apertures and other interruptions it takes a proportionately longer time, and an additional labourer to mix up the mortar. A good bricklayer will work one rod of plain brickwork in Flemish bond, the outside only being worked fair, in five days of ten hours each; boundary walls having both sides fair will take five and a half to six days. English bond may be executed in less time.

BRICKWORK. The practical observations to be made with respect to the physical laws to be considered in the application of brickwork, are: 1st, those which refer to the dimensions and the quality of the bricks; 2nd, those which refer to the modes of inserting them in the works; and 3rd, those which refer to their powers of resistance to the various efforts they are designed to resist. The last is the subject of the present article; the two former will be found treated in BRICK; BRICK MAKING; BRICK, SIZE OF; BOND; BRICK BOND; OPUS INCERTUM, etc.

Although many experiments have been made to ascertain the powers of resistance of single bricks (BRICK, STRENGTH OF; BRICK BEAM), none are recorded with respect to those of large masses of brickwork. Mr. E. CLARK, in his *Description of the Britannia and Conway Tubular Bridges*, fol., London, 1850, p. 365, gives an account of some trials of 9-inch cubes; these are reprinted in the *BUILDER Journal*, viii, 433; so many unforeseen contingencies, however, occur in the execution of large works, but which it is easy to guard against in hand experiments, and there is so wide a range in the powers of different materials to resist permanent or temporary loads, that it behoves the architect not to receive the laws so deduced with implicit confidence. It is not sufficiently born in mind by the English observers, that the powers of a material to resist permanent or temporary efforts are usually to one another in the proportions of three to ten; and as nearly all the recorded experiments upon the strength of materials have been made by the hydraulic press (itself a very doubtful instrument for this purpose), it follows that the results recorded must be modified in the above proportions, if they are to be considered as any guide in practice. A few notes upon some remarkable erections, and upon some well known accidents, must supply temporarily the absence of more elaborate observations.

Perhaps the most remarkable instance of the power of brickwork to resist a crushing weight that can be cited, is the chimney of the S. Rollox Chemical Works near Glasgow. It is 447 feet 6 inches high from the bottom of the foundations to the top of the capping; the diameter of the base being 45 feet, and that of the top 13 feet 6 inches, in both cases externally. From the few meagre details accessible, it appears that the (approximate) maximum permanent weight brought upon the inch superficial of brickwork of the base is 256 lbs., or 16 tons 14 cwt. per foot superficial. Mr. E. Clark's experiments showed that the average resistance of brickwork in cement was equal to about 33.5 tons per superficial foot. The S. Rollox chimney is fissured to a considerable extent, and is bound with iron in several places. Possibly the expansion produced by the heat of the ascending gases may have given rise to these fissures, as it is said to have done; but it seems also very probable that too close an approximation has been made to the ultimate or permanent resistance of the brickwork.

When the Barenton viaduct of the Rouen and Havre railways had fallen, the engineers of the *Ponts et Chaussées* insisted that the Malaunay viaduct upon the same line should be proved with a permanent and a rolling load able to cause a strain equal to 99½ lbs. per superficial inch of the weakest part of the structure. Strong protests were entered at the time against this test,

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which was considered to have been an exaggerated one; but the viaduct resisted it successfully, nor, when it is taken into consideration that good ordinary mortar of lime and sand, after about fourteen years, is capable of resisting a crushing weight equal to 498 lbs. per inch superficial, can the French engineers be considered to have required more than a fair test for a work completed nearly eighteen months previously. Vicat, it is true, considered that it was not safe to load brickwork executed in chalk lime mortar with more than from 85 to 90 lbs. per superficial inch of the area of the base; but the experiments from which he deduced this law were made upon small cubes of only 0.03937 of an inch on the side, and he adopted as the safety limit one-third of the instantaneous crushing weight.

It may perhaps be considered to be practically demonstrated that the resistance of good brickwork is limited by the resistance of the mortar employed; and that the latter yields before the bricks themselves become sensibly affected, even when the bond is of the best description and is carefully observed. Vicat's limits may very safely be adopted, and from the fact that no English workman ever prepares mortar properly, it is advisable to adhere to them as closely as possible. This remark, it may be added, applies with particular force to the hydraulic lime mortars, because they are usually the most carelessly made. Vicat then states that the instantaneous crushing weights, and the safe loads to be placed upon the respective descriptions of mortar, cited below, fourteen years old, are as follows, the latter being assumed to be 30 per cent. of the former loads.

	Instantaneous.	Per unit
Chalk lime and common sand	270 lbs.	81 lbs.
Ordinary hydraulic lime	1050	315
Eminently hydraulic lime	2043	613

Mr. Clark's experiments upon brickwork in cement did not give results as favourable as the above; for he states that the average resistance to an instantaneous breaking weight was only about 514 lbs. per inch superficial; but it is important to observe that, in the first place, Mr. Clark broke, but did not crush, the bricks; and in the second place, he did not record the age of the cement operated upon. Vicat, on the contrary, records its age; but he points to the inference in another part of the *Mémoire* from which this notice has already borrowed so much, that the rate of setting of such compounds does not exercise a very important influence on the resistance of the mass, provided of course that the work be not hurried. It may be added that the resistance of the S. Rollox chimney confirms the correctness of the rule laid down by Vicat: the base is not loaded beyond the limit he assigns as the safety limit to an effort of compression.

The fall of the Barentin viaduct illustrated, however, a law to which it is necessary to call particular attention. The bases of the piers were executed in rubble masonry of a species of indurated chalk cased by an inferior description of ashlar of the same material, the whole being laid in chalk lime. It is very doubtful whether plinths so constructed ought to have been loaded with more than a permanent crushing weight of 25 lbs. upon the square inch; but in fact the load brought upon them was equal to about 59 lbs. on the inch, and the viaduct fell precisely because the superincumbent weight crushed one of the plinths. Something of the same description occurred in 1847 at Euston-square Station, where the brick columns executed in cement crushed the subjacent brickwork in mortar; and the practical lesson to be drawn from these accidents is that the stability of constructions of similar descriptions depends entirely upon the resistance of their bases. If the latter be insufficient, the strength of the intermediate portions becomes a matter of indifference.

There is even a still more unsatisfactory vagueness in the recorded observations with respect to the resistance of brickwork to efforts of *extension* than prevails with respect to its resistance to efforts of *compression*; nor, with the exception of

Vicat's *Mémoire*, and the practical result obtained at the Maidenhead bridge of the Great Western railway, can anything be said to justify the attempt to draw definite conclusions upon the subject. Vicat's experiments appear to show that mortars resist efforts of tension with a force usually equal to about one-eighth of their power to resist compression, although in fact no absolute law can be said to prevail. In the Maidenhead bridge the arch of brickwork in cement can only be considered a solid curved beam resting upon two supports, because its dimensions do not allow the bricks to act as voussoirs; and if the load brought upon it be calculated at the rate of 100 lbs. per foot superficial of the bearing, it will be found that the intrados must resist an effort of tension equal at the maximum to a little more than 300 lbs. on the square inch. Vicat found the instantaneous resistance to tension of the best hydraulic mortar attained the comparatively high limit of 213 lbs. per square inch; and as the Maidenhead bridge was not constructed without accidents, it may be considered that the effort to which the materials of which it is built are exposed is greater than under ordinary circumstances it would be advisable to adopt as a safety limit. This illustration of the strength of brickwork in cement cannot, however, be considered to present any really valuable indications, because the resistance to tension must have been considerably affected by the introduction of the hoop-iron bond, and the separate or combined influence of the latter has not been ascertained; moreover, the curved form of the beam modifies the various dynamical efforts to which it is exposed, as well as the resistance it offered. Under such circumstances, therefore, it appears safer to adopt the results of Vicat's experiments, as representing the effective strength and the safety loads of the various descriptions of work described in the table subjoined.

	Instantaneous.	Safe
Ordinary mortar of chalk lime and sand resists efforts of tension equal to per superficial inch	57 lbs.	17 lbs.
Ordinary hydraulic mortar	129	39
Eminently hydraulic mortar	213	64

Brickwork is in practice rarely exposed to efforts of *torsion*, but Vicat has recorded in the *Mémoire* above quoted a short series of observations on its powers of resistance to such strains, from which it would appear that this resistance did not differ essentially from that presented to efforts of compression. Probably it would be safest to estimate it at about five-eighths of the latter force, because the experiments described do not appear to have been sufficiently numerous or sufficiently uniform in their results to warrant adherence to the higher values attributed to the different materials. All the usually received laws with respect to the practice in the application of brickwork are of a similar vague and empirical nature.

In the construction of walls for ordinary buildings it is found that the positive resistance of the materials to either of the descriptions of strains above described is not so essential a condition as the stability of the walls themselves. As RONDELET very properly observes, a wall 4 inches thick might be strong enough to carry the weight brought upon it, but it would not be stable enough to resist even the action of the wind against it. In isolated walls this action in fact becomes the condition which it is most essential to examine, and the moment of the resistance must be in excess of the effort exerted. The latter is ascertained by multiplying the pressure of the wind on the total surface by half the height, which will represent the average length of the leverage of the wind; and the resistance will be found by multiplying the weight of the wall by half the base. Calling t the thickness of a wall; h the height; w the weight of a foot cube of brickwork; p the pressure of the wind on a foot superficial. Then $\frac{thw}{2} \times \frac{h}{2} = ph \times \frac{h}{2}$; or $t = \frac{Vph}{w}$ will represent the thickness theoretically required. RONDELET also gives the formula for ascertaining the thickness of walls supported by

other walls at the ends, $\ell = \frac{h}{c} \times \sqrt{\frac{\ell^2}{\ell^2 + h^2}}$; in which c = some coefficient varying between 8 and 12, according to the stability required, and the other characters have the signification given in the case of isolated walls. AIR: WIND.

A consideration of perhaps equal practical importance to that of the power of brickwork to resist *dynamical efforts* is its capacity of resisting *ATMOSPHERIC INFLUENCES*. It is essential to bear in mind that bricks under-burnt are soluble in acids which do not attack either the earth of which they are made, or properly burnt bricks. Water containing carbonic acid gas appears to act upon all the feeble combinations of silica; and as nearly all river and rain water contains that gas, it should be the especial care of the architect to avoid the use of under-burnt bricks in situations exposed to either of those agents. Of course this remark would apply with even greater force to brickwork exposed to the alternate action of tides.

There is at all times greater danger in the alternations of dryness and humidity than in permanent saturation, both in the case of bricks and of stones. It is not in the foundations, nor in the portions of walls which are constantly damp, that disintegration of the building materials is to be observed; but they will be found to perish most rapidly at the level where the capillary action ceases—"between wind and water", as the workmen say. Even in the zone exposed to the destructive influences of these alternations, decay takes place to a greater extent in the centre of the larger materials than it does upon the edges; the mortar and the surfaces immediately in contact with it do not yield so readily to the destructive agencies, as the body of the bricks or stones. This is no doubt to be attributed to a chemical reaction between the various materials, produced by constant humidity; and it is thus that the hardening of some descriptions of brickwork in damp positions may be explained—a phenomenon commonly known as *water-bound*; the uncombined lime of the mortar and the soluble silicate of the bricks no doubt enter into combination with the alumina in the latter, and form an insoluble double silicate of lime and alumina. In constantly renewed water this effect would not take place, because the free lime would be washed away before the combination could be effected; but it is frequently observed in brickwork buried in damp situations, or in walls which retain stagnant waters. If it be desired, however, to employ masonry of any description to resist the various actions of running water, it is indispensable that the materials employed should not be able to take on any action under the influence of humidity. The bricks to be employed in such cases must be hard and thoroughly burnt, in order that the various combinations effected under the influence of heat may be so energetic as not to yield to any new combinations offered in the humid way; and the mortar must be made of the most energetically hydraulic limes or cements.

The species of decay between wind and water above alluded to, will also be observed to take place in a minor degree near the top of a wall: for the coping may often be observed to remain intact, whilst the brickwork will decay a few feet below it. The distance of this line of decay from the upper surface depends upon the capillarity of the materials; and it therefore follows that it is nearly as important to provide against the descent of rain water through a coping, as to provide against its ascent from the foundations. Yorkshire and Caen stone coping being now very generally used in southern England, it equally follows that precautions should be taken in bedding it to prevent the passage of water through the stone, either by laying it in cement or by placing slate or other impermeable materials in the mortar bed.

Some authors, upon the strength of building materials, attach a greater importance to their absorptive powers than appears to be warranted by actual observation. The laws which regulate the action of water in capillary tubes, during congelation,

are not yet sufficiently ascertained to decide as to what extent this power may affect the durability of building materials; but it is known that Yorkshire stone, and even many bricks which are capable of taking up large quantities of water, do not suffer from frost to the same extent as many of the harder and less absorbent materials. With the Suffolk bricks this fact is particularly evident; and indeed it is even to be suspected that of these bricks, those of the closest and hardest texture are precisely those which are most likely to be destroyed by frost. It may be that the hardest Suffolk bricks are more exposed to become fissured in the kiln by the unequal contraction produced by the fusion of the lime, silica, and alumina of the marl from which they are made: and that the water which passes through the faces of the bricks accumulates in these fissures in quantities sufficient to "blow" the exposed surfaces, towards which of course there is little resistance; but this at least may be often remarked, that in a wall of Suffolk brickwork the faces of the hardest bricks will often be removed to a considerable depth below those of the softer bricks around them. The same fact may be observed with other kiln burnt bricks, both in England and France; but, strange to say, it does not seem to hold with clamp burnt bricks, for the resistance of these to atmospheric influences is directly and solely proportional to their hardness and impermeability.

BROGNART, *Traité des Arts Céramiques*, 2nd edit., 8vo. and fol., Paris, 1854; RONDELET, *L'Art de Bâtir*, with *Suppl.* by BLOUET, fol., Paris, 1842-46; CLAUDEL, *Formules à l'usage des Ingénieurs, des Architectes*, etc., 3rd edit., 8vo., Paris, 1854; *Les Annales des PONTS ET CHAUSSEES* for 1832; *Les Annales des TRAVAUX PUBLICS DE LA BELGIQUE* for 1855; the *CIVIL ENGINEER and BUILDER Journals*, *passim*; Paper read at the ROYAL INSTITUTE OF BRITISH ARCHITECTS 11 June 1855, on the *Bill for Regulating the Thickness of Walls*. PASLEY, *Outline of a Course of Practical Architecture*, etc., 4to. (lithographed), Chatham, 1826, p. 275, gives examples of executed modern buildings, with dimensions of their walls. G. R. B.

BRICKWORK, EXPANSION OF, as exemplified in the chimney shaft at Mr. Thomas Cubitt's works; see *Paper* read at the ROYAL INSTITUTE OF BRITISH ARCHITECTS April 1845, given in *CIVIL ENGINEER Journal*, viii, 207. EXPANSION.

BRICKWORK, BEDS AND JOINTS OF. Joints, whether vertical or horizontal, are finished in various ways. The most common are the *struck joint*, A, merely finished by drawing the point of the trowel; or *jointed* by a tool called a *jointer*, B, having a raised rib so as to leave a line on the face of the joint, C; or *flush jointed*, D, in which case the joint is drawn at top and bottom with the



trowel when the brick is laid, and afterwards when the mortar is partially set the middle of the joint is flushed flat, E, with another jointer. These jointers often consist simply of a piece of iron of the width required to mark the joint, and bent for ease in striking. POINTING. A. A.

It is usual to direct that the courses of brickwork shall not exceed a certain height, varied according to the average thickness of the bricks used; this for large bricks is generally calculated at four courses to the foot in height, but in ornamental brick fronts, or smaller bricks, 11½ inches is more usual, as the joints should not exceed three-eighths of an inch.

Many writers have stated that the joints should be as close as possible, in order to allow the mortar to get a key to the brick; this is true if the bricks are wetted before they are laid, but VIOLETT LE DUC, *Dict. s. v. Brique*, quotes the opinion of M. Millet, that brickwork with thick beds of mortar has extraordinary strength. This might be expected; for as bricks are porous and are generally used dry, they absorb much of the water out of the bed of mortar, which prevents its due solidi-

fication in a proper time: the observation is made of brickwork with beds and courses each about 1½ inches thick. A house in the south-west corner of Hanover-square, London, is said by BROWN, *Domestic Architecture*, 4to., London, 1842, p. 140, to have been built with mortar reduced to the consistency of cream, the bricks being driven close upon each other, and the work appears perfect.

BRICKWORK, WATERPROOF. To render porous bricks waterproof, it is recommended that one or two coats of boiled oil should be applied externally when the brickwork is quite dry. The solution proposed by Mr. Sylvester, either for stone or brick walls, consists of three-quarters of a pound of mottled soap mixed in a gallon of water, used boiling hot and applied with a large brush so as not to lather on the surface. This wash after twenty-four hours, when it has become hard and dry, is to be followed by a second application, composed of half a pound of alum thoroughly dissolved in four gallons of water; *CIVIL ENGINEER Journal*, vi, 466. Workman's process for rendering common bricks waterproof or non-absorbent by the application of oil and sugar of lead, was rewarded with a prize medal at the Exhibition of Industry 1851. The waterproofing takes place either during the first process of manufacture, or after the brick is completed, at a cost of about 6s. per thousand. The machine, etc., is described in the *CIVIL ENGINEER Journal*, xv, 112. **BRICK, ABSORPTION OF.**

BRICKWORK, WEIGHT OF, see BRICK, WEIGHT OF.

BRIDEWELL. A name frequently given to houses of correction in different parts of England, and derived from the hospital and school founded near S. Bride's well in Blackfriars, London, by Edward VI, which were afterwards converted into a receptacle for disorderly apprentices, being the first place of confinement in which penitentiary amendment was a leading object. 14.

BRIDGE (It. *ponte*; Sp. *punto*; Fr. *pont*; Ger. *brücke*). A structure, spanning by one or more beams or arches, a road, river, or other obstruction to the intercourse between places, and affording means of passage between them.

A similar construction for such a purpose over a wide valley or a plain is called a **VIADUCT**; and if used for the conveyance of water for consumption solely it is called an **AQUEDUCT**: whence the terms viaduct bridge and aqueduct bridge are commonly employed in speaking of such constructions as cross any low country, river, etc.

Long **CAUSEWAYS** like those of China and of Mexico, the weirs of Indian rivers, the **BUNDS** of Oriental artificial lakes, and dams like the "Western Avenue" at Boston in North America, although in constant use as roadways, are not herein considered as structures deserving the name of bridge, any more than the so-called railway bridge over the lagoons at Venice, the timber bridge at Esseck over the Drave and Danube, and that at Ouzan Kupri over the Erkenah, which are viaducts or causeways, and not solely bridges according to the above definition.

The term 'natural bridge' has been applied to cases where rocks have either fallen together, or have been washed away, so as to leave passages above and below like an artificial bridge.

Some bridges afford more than one passageway: such are the two-way bridges in several aqueducts, where the road passes under the canal, as at Aderno in Sicily, at Spoleto and at Civita Castellana in Italy, at the *pont du Gard* and the *pont de Buc* in France; the high-level bridge at Newcastle-upon-Tyne, having a railway over the roadway; and the Dean bridge at Edinburgh. The three-way bridge at Croyland, to which allusion is made in a charter dated in 943, under the title of the "triangular bridge of Croyland" (the style of the present structure belongs to the early part of the fourteenth century), has the passages all on the same level, which is also the case with the cross-road or four-road bridge called the *pont Sanspareil*, built in 1752 at Ardres in France, on which four roads meet.

The design and construction of bridges of any magnitude demand the exercise of the highest architectural skill and taste,

especially when such structures are to be erected in a city. Their beauty consists chiefly in apparent strength and solidity combined with boldness of construction, in the employment of the materials, and in the due proportion of the solids to the voids. When arches are employed, the precision of their curvature is of the highest importance. Though boldness and simplicity are acknowledged to be essential points, they have been carried to an excess of plainness by some modern architects; whereas the judicious introduction even of rusticated work would have broken the monotony of the large masses, and have enriched the effect of their structures.

The following publications contain the principles, practice, and history, with illustrations, of each kind of bridge:—HAHN and HOSKING, *Theory, Practice, and Architecture of Bridges*, (known as *WEALE'S Bridges*), 8vo., London, 1843, and *Supplement* by BURNELL, 1850; CRESY, *Practical Treatise on Bridge Building* (no text), etc., fol., London, 1839, etc.; CRESY, *Encyclopædia of Civil Engineering*, 8vo., London, 1847; BREES, *Railway Practice*, fourth series, 4to., London, 1837-47; DUGGAN, *Specimens of Stone, Iron, and Wood Bridges, etc., of the United States' Railway*, fol., New York, 1850; GAUTHY, *Traité de la Construction des Ponts*, edited by NAVIER, 4to., Paris, 1809-16, and Mons, etc., 1843; WIEBEKING, *Theor. Prac. Buerg. Baukunde*, 4to., Munich, 1821-7, and *Analyse Historique*, 4to., Munich, 1838-40; CLARK, *Britannia and Conway Tubular Bridges*, 8vo. and fol., London, 1850; FAIRBAIRN, *on the same*, 8vo., London, 1849; PROVIS, *History, etc., of Menai and Conway Suspension Bridges*, fol., London, 1828; NAVIER, *Mémoires sur les Ponts Suspendus*, 4to., Paris, 1830; LE BLANC, *Pont Suspendu de 198 mètres d'ouverture*, etc., 4to. and fol., 1841; TURNBULL, *Investigation of Dredge's Principles*, 8vo., London, 1841. The *BAUZEITUNG*, and the *CIVIL ENGINEER*, etc., *Journals*, *passim*; with many of the Dictionaries and Encyclopædians for their history.

Works illustrating the construction of special bridges will be found under the names of the towns to which they belong; viz. Ardres, Chester, Cubzac, Dublin, Florence, Ivry, Llantrissant, London, Moulins, Nantes, Nemours, Orleans, Paris, Rome, Ronen, Runcorn, Saintes, Saumur, Turin, and Venice. That at Bordeaux is entitled *DESCHAMPS, Pont de Bordeaux*, fol.

The following are the titles of books containing a large mass of general information on this subject:—EULER, *Method of Judging of the Strength of a Bridge from a Model*, in *Nov. Comment. Petrop.*, xx, p. 271; SAUNDERS and PURKIS, *Report on Public Bridges in the County of Middlesex*, 4to., Lond., 1826; TELFORD, *Reports on Roads, Harbours, Bridges, etc.*, fol., London, 1822; TELFORD, *Life of*, written by himself, and edited by J. RICKMAN, 4to. and fol., pl., London, 1838; SIMMS, *Public Works of Great Britain*, fol., London, 1838; FULTON, *A Treatise on Canal Navigation, etc., and Designs for Aqueducts and Bridges*, 4to., London, 1796; TREMBLEY, in ROZIER, *Observations*, xxxiii, p. 132; JORDAN, *Specification of the Patent for his Invention in the Art of Constructing Bridges, Aqueducts, etc.*, 8vo., Bristol, 1797; WHITE, *On Cementitious Architecture as applicable to the Construction of Bridges*, with a notice of the first introduction of iron for arches of large span, 8vo., Lond., 1832; ZABAGLIA, *Castelli e Ponti di*, etc., fol., Rome, 1743; LIEPOLD, *Theatrum Pontificiale*, being a general history of the invention of bridges, etc., fol., Leipzig, 1726; SCHRAMM, *Schauplatz der Merkwürdigsten Brücken*, fol., Leipzig, 1735; GOURY, *Ainé, Souvenirs Polytechniques, ou Recueil d'Observations*, etc., 2 vols., 4to. & fol., pl., Paris, 1827; COURTIN, *Travaux des Ponts et Chaussées depuis 1800*, 8vo., Paris, 1812; ANSELIN, *Expériences sur la Main-d'Œuvre de différents Travaux dépendants du Service des Ingénieurs des Ponts et Chaussées*, etc., 4to., Boulogne, 1810; PAPERS OF THE CORPS OF ROYAL ENGINEERS, 10 vols., 4to., London, 1838, etc.; LE SAGE, *Recueil de divers Mémoires, etc., des Ponts et Chaussées*, 2 vols., 4to., Paris, 1810; *ANNALES DES PONTS ET CHAUSSÉES, Mémoires et Documents relatifs à l'Art des Constructions au Service de l'In-*

génieur, etc., 1st series, 30 vols., 8vo., Paris, 1834-40, 2nd series, 45 vols., 8vo., Paris, 1841-55; AIDE MÉMOIRE, 3 vols., 8vo., London, 1845.

DELAISTRE, J. R., *Encyclopédie de l'Ingénieur ou Dictionnaire des Ponts et Chaussées*, 3 vols., 4to. and fol., Paris, 1812; EXCHAQUET, *Dictionnaire des Ponts et Chaussées*, 8vo., Paris, 1787.

ARCH; BENT TIMBER; BRICK BRIDGE; BOW AND STRING BRIDGE; BOX BEAM; BURR, AND BUSSE'S BRIDGE; CENTERING; CHAIN BRIDGE; COOPER'S INVERTED ARCH BRIDGE; COMPOUND GIRDER BRIDGE; FOUNDATION; GIRDER BRIDGE; HOWE'S BRIDGE; HOLLOW GIRDER BRIDGE; IRON BRIDGE; LAMINATED RIB; LONG'S BRIDGE; LATTICE BRIDGE; TIMBER AND IRON; OBLIQUE BRIDGE; POLONCEAU'S BRIDGE; PLATE GIRDER BRIDGE; RIB BRIDGE; SKEW BRIDGE; STONE BRIDGE; SUSPENSION BRIDGE; TIMBER BRIDGE; TOWN'S BRIDGE; TRUSSED GIRDER BRIDGE; TUBULAR BRIDGE; TUBULAR GIRDER BRIDGE; TUBULAR BOW BRIDGE; WIEBEKING'S BRIDGE; WARREN'S COMPOUND GIRDER BRIDGE.

BRIDGE. The literal translation of the Latin *pons*, for a pulpit stretching across a building in a manner similar to a rood-loft; such as that which formerly existed in the church of Sta. Maria Novella at Florence, by which the males were divided from the females during Divine Service, and which was destroyed 22 October 1665. MARCHESE, *Lires*, 8vo., Dublin, 1852, i, 89, quoting BILIOTTI, *Chronica*, etc., vi, 9; and GAYE, *Corteccio inedito*, 8vo., Florence, 1840.

BRIDGE. A term used for a piece of timber crossing over several others parallel to each other; thus the rafters in a common roof, 'bridge' over the purlins. 1.

BRIDGE BOARD, or NOTCH BOARD. A board in which the ends of steps of wooden stairs are grooved or notched. 2.

BRIDGE - BUILDING CONFRATERNITIES AND CORPORATIONS, see EDILES, CURATORES, PONTIFICES.

BRIDGED FLOOR. The term applied to a floor in which BRIDGING JOISTS are used. 1.

BRIDGED GUTTER. The term applied to a flat-bottomed GUTTER formed by boards resting on bearers which bridge over a space between a portion of the rafter and the wall, or between two rafters. 1.

BRIDGE STONE. The name given to a stone landing (when not supported by an arch), crossing an area between a door and a pathway. 2.

BRIDGETINE BUILDINGS, THE. From a very early period the laws of monastic life generally observed did not allow monks and nuns to dwell in the same establishment: but there were always exceptions to these laws, and probably the latest institution which was approved in contravention of them by the papal authority was that of the Bridgetine, founded in 1376, with DOUBLE MONASTERIES, or rather a monastery and a convent so connected that one church served for both, the sixty females under the abbess occupying the upper portion, and the thirteen monks under her deputy, the prior, using the lower portion of the church. WEEVER, *Funeral Monuments*, fol., London, 1631, p. 149. CONVENT.

BRIDGETOWN. The capital of the island of Barbadoes. The principal features of the town are a handsome market place; Trafalgar-square, with a statue of earl Nelson erected in 1813; and the cathedral church, dedicated to S. Michael, a large but plain edifice, rebuilt in 1789, with towers scarcely raised above the roof, for fear of hurricanes; for the same reason the church of S. Mary has no steeple. A synagogue; a court house, which contains the council room, assembly room, and prison; two public schools, one of them originally founded as a college; barracks; and the military hospitals, are of minor importance.

BRIDGING or BRIDGING PIECE. This name is only properly given to a piece of timber placed between the heads of two others, to prevent their nearer approach; but such a timber is improperly called at one time a STRUTTING PIECE, which is employed at points between the head and the foot; and at other

times a STRAINING PIECE, which is situate between the feet of posts or struts.

BRIDGING JOIST. A joist which carries the floor boards in double flooring, and rests either upon a BINDING JOIST carried by a girder, or else upon a BINDING BEAM, as shown in the illustrations to those articles.

Bridging joists ought not to be above twelve inches apart, nor their bearing to exceed ten or twelve feet. When employed in floors next the ground, oak is frequently used in preference to fir.

BRIDLING. The term employed in the north of England for 'trimming'. 8.

BRIEDELIA. The wood of several of its species forms large and excellent timber, having a fine grain. *B. stipularis* (*kohi*) is a close, hard, tough wood of Gualpara, East Indies. The *assama*, *B. montana*, is common in Canara, where it attains great size, and for building purposes seems little if at all inferior to teak: it is said to resist the action of water quite as well. 77.

BRIERE (. . . . LA) was architect to the comte d'Artois about the year 1785: a plan for a cemetery designed by him is in the Mus. Brit., *Royal Collection of Maps*, etc., lxiii, 53.

BRIEUC or BRIEUX (SAINT). A seaport in France; the capital city of the department Côtes du Nord. The town is badly built, with old winding streets, but is rapidly extending on a better plan towards the new port at the village of Legué. It contains four large *places* with fountains, and a cathedral dedicated to the Irish saint after whom the town is named; this building is described by BOURASSE, *Cathédrales de la France*, 8vo., Tours, 1843, as having parts of the transept and apse in the *style ogival primitif*, the upper portion of the church in the *style ogival secondaire*, with a modern nave and aisles. The town also contains a large and remarkable monastic building, two law courts, three large schools, a public library and picture gallery, a theatre, a fine hospital, and a handsome granite bridge over the river Gouet. 96.

BRINDISI (the ancient BRUNDISIUM or BRUNDISIUM). A seaport city of the province of Terra di Otranto in the kingdom of Naples. The town was almost destroyed by an earthquake in 1486, since which period it has gradually decayed; but it possesses a fine castle, commenced by Frederick II (1212-50) and completed by Charles V (1519-58), and a large cathedral church, dedicated to the Virgin and S. Teodoro, containing a mosaic pavement: this building, as well as the *seminario*, were nearly destroyed by an earthquake in 1743, but both were restored within the four subsequent years. There are also several churches, convents, and hospitals, a public library, and a cipollino marble column about 50 feet in height, near the cathedral, with the pedestal of a similar column which fell in 1456, and was removed in 1528 to Lecce: the capital is decorated with figures of Syrens and Tritons intermingled with the acanthus leaf, and a circular vase placed on it has caused the columns to be regarded as supports for beacons. SWINBURNE, *Travels in the Sicilies*, 4to., London, 1783, i, 383.

BRINGING UP or CARRYING UP. The terms used by workmen when speaking of building a wall.

BRIOLLOTUS designed and executed at Verona the "parent or progenitor of all other wheel windows" (?), viz. the WHEEL WINDOW of twelve lights radiating from a central foliated circle, in the west front of the church of S. Zenone; MAFFEI, *Verona Illustrata*, 4to., Verona, 1731, iii, 135.

BRIOSCHI (BARTOLOMEO) is entered in the list of architects to the cathedral at Milan, under the date 1503. 27.

BRIOSCO (ANDREA), also called Riccio and Il Riccio, or the Latin equivalent Crispus, was born in 1469 (but 1459 according to GIULIANELLI), and became a pupil of Bellano or Vellano. The church of Sta. Giustina at Padua is said to have been designed by him about the year 1501: LALANDE, *Voyage en Italie*, 12mo., 1769, viii, 264, and MILIZIA, say 1521. It is probable that there is more correctness in MORELLI and PIACENZA, who

state that the church was commenced about 1502 by Girolamo da Brescia, and was continued by Briosco (others say by Andrea Morone), MILIZIA adds with Alessandro Leopardi of Venice; the church was finished about 1549. Briosco also designed the tomb of della Torre in the church of S. Fermo Maggiore at Verona, given by CIOGNARA, *Storia*, ii, 141, pl. 36-7; some of the bassi-relievi from which are now in the Louvre. He died 8 July 1532, and was buried in the cemetery of S. Giovanni in Verdara at Padua, with an inscription given in VASARI, *Lives*, 8vo., London, 1850, ii, 73. 3. 68.

BRIOSCO (ANTONIO) is said by WORNUM, *Catalogue of Ornamental Casts*, 8vo., London, 1854, to have built the Scala dei Giganti in the cortile of the ducal palace at Venice; but see BREGNI, CALENDARIO, and RICCIO (ANTONIO).

BRIOUDE (the Latin BRIVAS). A city in the department of the Haute Loire in France. The town is badly built, with narrow streets, and is only remarkable for the very fine Romanesque nave and apse, with Pointed transepts, formerly belonging to the mitred abbey of S. Julien, illustrated by NODIER and TAYLOR, *Voy. Pit.*, fol., Paris, 1829, pl. 140, etc. (Auvergne). The few ancient mosaics in the head of the apse are unique in France. The details, pl. 144, are a mixture of late Roman, Byzantine, Saracenic, and Romanesque work. The only other buildings of public importance are two law courts, and a public library and school: the fontaine de S. Ferréol given in pl. 145, deserves study. The church of la Chaise Dieu, built in 1343, and illustrated by NODIER, pl. 146-51 *ter*, is 302 feet long and 95 feet wide without including the chapels. It is remarkable for a machicolated tower, one hundred and fifty-six stalls, a stone pulpit and jubé, a Renaissance organ gallery carried by four colossal figures, a peculiar façade and long staircase of approach, the reversed foliation of the tombs, the cloisters, the Dance of Death in fresco, and some tapestry of the fifteenth or sixteenth century. The bridge of one arch over the Allier at la Vieille Brioude is 151 feet span, 24 feet 7 inches wide, and 83 feet 9 inches high from the water to the pavement; it was erected in 1840; CIVIL ENGINEER *Journal*, vii, 247: the former arch is represented in GAUTHÉY, *Traité*, 4to., Paris, 1809, pl. iv, fig. 56; and slightly pointed in LABORDE, *Monumens*, fol., Paris, 1816, pl. 204.

BRISSEUX (CHARLES ETIENNE), born about 1680 at Baumeles-Dames in Franche Comté, published *L'Architecture Moderne ou l'art de bien bâtir pour toutes sortes de personnes*, etc., 4to., Paris, 1728, with 143 plates, apparently of executed designs for houses in Paris; which was augmented to double the original size in an edition published by Jombert, 4to., Paris, 1764: this work is frequently attributed to Jacques François BLONDEL, on account of the false title, *Traité de l'Architecture dans le goût Moderne*, to his work *De la Distribution des Maisons de Plaisance*, etc., 4to., Paris, 1737. Brisseux also wrote *L'Art de bâtir des Maisons de Campagne*, 4to., Paris, 1743, with 260 plates; and *Traité du beau essentiel dans les Arts, appliqué particulièrement à l'architecture et démontré physiquement et par l'expérience. Avec un traité des proportions harmoniques, etc. Plusieurs essais de l'auteur, etc., et une abrégé de l'histoire de l'architecture*, 2 vols., fol., Paris, 1752, which work is also called *Traité complet de l'Architecture*, Paris, an. v.: it contains the plan of a house built by him for M. Dogny, in the rue Neuve Grange-batelière. Brisseux or Briseaux died 23 September 1754. 83.

BRISSEY (MICHEL DE) of Brussels rebuilt in 1731, the magnificent church of S. Pierre at Douai, of an Ionic order; SCHAYES, *Hist.*, 12mo., Bruxelles, 1850, iv, 200.

BRISTOL. A city situated at the junction of the shires of Gloucester and Somerset in England, and is now rather more than ten miles in circumference. The old town has narrow streets with lofty and inconvenient houses of timber and stone construction. Many roofs of the mediæval period still exist, besides houses, rooms, and chimney-pieces of the periods of Elizabeth, James I, and Charles I. Colston's house in Small-

street; Canynge's house in Redcliffe-street; Red Lodge in Park-row, and S. Peter's hospital, are particularly deserving of attention; and Stuckey's bank has lately occupied an old Gothic timber structure, said to have been formed in Holland. Clifton, the "west end" of the city, and the new buildings, are constructed with Bath, Hanham, and other stones of the locality; the water supply was completed in 1849; and a perfect system of drainage is now in course of formation. The upper and lower arcades, by Messrs. Foster and Oakley, were formed in 1824-5, they are 600 feet long and 12 feet wide, and very light. Queen-square, laid out in 1680, contains $7\frac{1}{2}$ acres of ground, and was considered the largest in England after Lincoln's-inn-fields in London. The high cross, erected in 1373, was presented to the late Sir R. Colt Hoare, in whose grounds, at Stourhead, it remains. A new cross was commenced August 8, 1850, by John Norton; BUILDER *Journal*, viii, ix.

Two cast iron bridges, each 100 feet span, were erected by W. Jessop, engineer, in 1810; one recently destroyed is replaced by a wrought iron girder bridge. A stone bridge of three arches, rebuilt 1761-8, has a central elliptical arch of 55 feet span. The station (Tudor) was erected 1841 by Brunel and Westmacott; it is illustrated in BREES' *Railway Practice*, series 4, pl. 64; and in series 1, pl. 42 is given the skew arches over the float; the Exeter station, erected 1852-3, is by S. C. Phipps; and the Great Western hotel (Roman Ionic) was enlarged 1837-8 by R. S. Pope.

The church of the Augustinian monastery was created a cathedral and dedicated to the Holy Trinity in 1542; it is the smallest in England as the nave and aisles have been destroyed. The chapter house and its remarkable vestibule; the lower part of the gatehouse at the south-west angle of the college green (one of the finest existing specimens of the Norman style in England; one of the archways was probably rebuilt in that style when the Tudor structure above it was erected); these, with some doorways of the bishop's palace, were all erected about 1142. Several parts of the cathedral exhibit portions of the original building; a Norman staircase is very peculiar. The chapter house was restored in 1833 by R. S. Pope; its vaulting is formed of Brandon-hill stone; the intersections of the vaults are not bonded, but rest on Dundry stone ribs; the arches are slightly pointed. The main portion of the present cathedral was erected 1306-32; the elder Lady chapel adjoining the north aisle about 1234; and the remainder of the edifice before 1368. BRITTON states that John Ashfield, master of the works, designed the tower, etc., 1472-91; but the tower is generally said to have been built 1428-63, and finished before 1480 under abbot Hunt, who also added the upper part of the south transept, the embattled parapet and pinnacles all round, and roofed the church anew. These works were executed in Dundry stone and new red sandstone. The north transept was erected 1480-1520, as well as the refectory, cloister, and upper part of the before mentioned gateway. The fine stalls were added about 1515; and the throne 1542-58; the stone pulpit in the ante choir in 1625; and in 1629 the present west window and organ. Only the east and north sides of the cloister, some relics of a Norman nave, and of a south-west tower, remain. The total interior length is 171 feet 9 inches; the tower is 34 feet square inside, and 120 feet high to the top of the battlements; the choir is 31 feet wide, and with the aisles 70 feet 8 inches, and the height of each is 52 feet to the top side of the groins, there being no clerestory to the choir. The arrangement of the ribs of the groining brings their lateral pressure on a level, thus setting aside Sir C. Wren's objection to Gothic groining. The transepts are 125 feet long from north to south.

The church of S. Mary Redcliffe, esteemed one of the most elegant mediæval ecclesiastical structures in England, was commenced about 1292; of this period, only the inner north porch, and the lower part of the tower (Early English) remain; the outer north porch and upper part of the tower (both Decorated) were next erected. About 1367-76, William Canynge com-

pleted the body of the church from the cross aisle downwards; including the south transept, south porch, and much of the interior (late Decorated). The remainder (Perpendicular) is due to the second William Canynge or Cannings, after the spire had been destroyed by lightning and the building otherwise damaged, 1445-6; *BUILDER Journal*, ix, 476, 482. Sir Thomas Mede's tomb in the north aisle dates about 1480. The church is in the form of a cross with aisles to both transepts and choir; the interior dimensions are 239 feet long including the Lady chapel; 20 feet 10 inches wide between the columns, and 57 feet including the aisles; the chancel is 53 feet high from the pavement to the stone groining. The transepts are 117 feet 6 inches long from north to south, 45 feet wide including the aisles, and of the same height as the nave. The tower is 21 feet 6 inches square inside, and with the portion of spire remaining is 250 feet high; the spire is 26 feet 6 inches diameter at bottom, 20 feet at top, and is 36 feet high; it is 2 feet 3 inches thick at the bottom, tapering in the height of 19 feet to 8½ inches, which is continued up. The beautiful and perhaps unique groining of the north transept has scarcely been noticed. It appears as if suspended from arches which rise to the top of the windows, while the principal portion of the groining is considerably below that level, giving an appearance of a hanging covering. The restoration of this edifice was commenced in 1846, under the direction of Messrs. J. Britton and G. Godwin; Caen stone being used in lieu of the Dundry stone of which the edifice is built. *BUILDER Journal*, iv, v, and xi.

There are about eighteen churches and chapels belonging to the Established Church, varying in date from 1130 to 1795, which deserve attention; and about twenty-three others erected during the present century: of these Trinity, Hotwells (1829-32), by C. R. Cockerell; S. George, district (1823), by Sir R. Smirke, are the largest; and S. John the Baptist, Bedminster (1854-5), by J. Norton, is the latest. There are also the Roman Catholic cathedral (1839-48) by H. E. Goodridge; S. Mary on the Quay (1839) by R. S. Pope; Highbury Independent chapel (1843) by W. Butterfield; Baptist chapel, Clifton (1842), by R. S. Pope; Arley chapel (1855) by Messrs. Foster and Wood; and a Wesleyan chapel, Castle-green, by — Crisp. The general cemetery was consecrated 1840, the buildings designed by C. Underwood.

The exchange was erected 1740-3, by John Wood of Bath, and was restored in 1851 (Wood, *The Exchange*, 8vo., Bath, 1745); the guildhall, 1843-6, by R. S. Pope (*BUILDER Journal*, iv; *COMPANION TO THE ALMANACK*, 1845; *ILLUSTRATED LONDON NEWS*, iii); the council house, 1824-7, by Sir R. Smirke; the commercial rooms, 1811, by C. A. Busby; the custom house, 1836, by Sydney Smirke; the excise office, by — Herbert, 1833-40; the gaol, by H. H. Seward, and restored in 1831 by R. S. Pope; the Gloucestershire county prison on Howard's system, 1810, and enlarged, 1833, by T. Fulljames; the bride-well, 1832; the central police station house; the cattle market, 1830, of four acres in extent, with a trotting course 420 feet long by 30 feet wide; the meat market, 1848-9; the vegetable market, 1855, are all by R. S. Pope; and the baths and wash-houses, 1849, by P. P. Baly.

The general hospital was erected 1855-6, by W. B. Gingell and Lysaght; the royal infirmary, of various periods from 1784-1848, the centre portion being by J. Hague and W. Paty; S. Bartholomew's hospital, now adapted as a model lodging-house by Messrs. Foster and Wood; the asylum for the blind, 1838-9, by T. Rickman and R. C. Hussey; Foster's almshouses, rebuilt 1702, the chapel (*temp.* Henry VIII) remains; the female orphan asylum, Hook's mills, by C. Dyer, and the new orphan house, Ashley Down, 1847-9, was carried out by Messrs. Foster and Son.

Queen Elizabeth's hospital, or the city grammar school, was erected 1845-7, by Messrs. Foster and Son; the city grammar schools were founded 1532; the college grammar school, *temp.* Henry VIII; the bishop's college and chapel were erected

1835, by C. Dyer; the Baptist college, about 1810, by D. A. Alexander; and the Redmaids' school, 1844, by Messrs. Foster and Son. Amongst the later ones are the Counterslip schools, 1844, by W. Armstrong, the ground floor and mezzanine being occupied as corn warehouses; the Friends' school, formerly the White Friars' monastery, restored 1850 by W. Armstrong (*BUILDER*, viii); the new Redcliffe schools, 1855, by S. C. Fripp; and the Redcliffe infant schools, 1854, by G. Godwin (*BUILDER*, xi). At Fishponds near Bristol is the Gloucester and Bristol diocesan training institution for 75 mistresses, erected 1849-50, by J. Clarke and J. Norton.

The theatre, opened in 1766, was highly eulogized by Garrick for its just dimensions, which are, 33 feet long from the stage lights to the boxes, and 29 feet 10 inches wide; the side boxes are 6 feet 9 inches deep, and at right angles with the stage; the back of the theatre is a semicircle, and has boxes 14 feet deep; the stage and proscenium are 40 feet deep; and the whole width inside the walls is 48 feet 6 inches. The Victoria rooms at Clifton were erected 1839-41 by C. Dyer (*COMPANION TO THE ALMANACK*, 1839; *ILLUSTRATED LONDON NEWS*, xix); the Clifton hotwells by H. H. Seward; the Bristol or philosophical institution, 1820-3, by C. R. Cockerell; the Athenæum, 1854, by Messrs. Foster and Son; the West of England bank, 1855-6, by Messrs. Gingell and Lysaght; Messrs. Miles and Co.'s bank, by J. Nash; Stuckey's new banking house, 1856, by R. S. Pope; the Bank of England branch, about 1847, by C. R. Cockerell; and a fire office in Corn street, by — Young of London, complete the list of buildings of leading architectural importance.

BRITTON, *Bristol Cathedral*, fol., London, 1830. BRITTON, *Redcliff Church*, 8vo., London, 1813. BRITTON, *Bath and Bristol illustrated*, 4to., London, 1829. DALLAWAY, *Antiq. of Bristol*, 4to., Bristol, 1834. DALLAWAY, *Worcester Rediculus; or Notices of Church Architecture in Bristol*, 4to., Bristol, 1824. WINKLE, *English Cathedrals*, 4to., London, 1836-42. *Report of the Commissioners appointed under the Bristol Damages Compensation Act*, fol., Bristol, 1835. *Account of the Hospitals, Almshouses, and Schools*, 4to., Bristol, 1775. MANBY, *Guide from Clifton*, 8vo., Bristol, 1802. BARRETT, *History of Bristol*, 4to. *The New History, etc., of Bristol, a Guide, etc.*, 8vo., Bristol, 1794. CORRY and EVANS, *History of Bristol*, 4to., Bristol, 1816. SEALY, *Architecture of Bristol*, 1843. CHILCOTT, *Guide*, 8vo., Bristol, 1855; and his *Descriptive History of Bristol*, 10th edit., 8vo., Bristol, 1854. EVANS, *Chronological Outline*, 8vo., Bristol, 1824.

BRISTOL MARBLE is of two sorts, both of some value, as good chimneypieces, as well as excellent lime for plastering and work above ground, are made from it. The S. Vincent rock is of a variegated reddish brown colour, and the Black rock has a black ground with a few white shells.

BRITANNI, see CARYATIDES.

BRITTLENESS, see MALLEABILITY.

BRIXEN (It. BRESSANONE). A regularly but ill built and badly paved city in the circle of Pusterthal, in the Tyrol. It contains a large modern cathedral of white marble with four towers, dedicated at first to the Assumption, afterwards to SS. Cassiano, Ingenuino, and Alboino, and at present to S. Giuliano, it has early cloisters; the adjoining church of S. John was formerly the cathedral; a large episcopal palace, three parish churches, as many convents, two monasteries, as many public schools, a town hall, prison, and hospital. Johann Kessler, a painter and architect, built in 1711 the church to the Holy Guardian Angel. 26. 96.

BRIXIA. The Latin name of BRESCIA.

BRIZGUZ Y BRU (ATHANASIO GENARO), wrote the *Escuela de Arquitectura Civil*, 4to., Valencia, 1738, which is modelled upon an edition of D'AVILER's *Vignola*.

BRIZIO, see BRICCIO.

BRIZUELA (EL MAESTRO PEDRO), was *aparejador* of the palace at Valsain in 1613, and in 1615 designed and directed

the execution of several works to the cathedral at Segovia, including the winding staircase to the top of the building; the roofing of the edifice and the restoration in stone of the lantern on the dome, which had been burnt; and in 1620 the portal of the Doric order to the north transept, which has been attributed to Francesco de Mora and to Juan de Herrera. 66.

BROACH. A piece of steel from two to six inches in length, and of various diameters up to three-sixteenths of an inch: it is made pentagonal in section, so as to form five cutting edges for the purpose of enlarging circular holes in metal work. **BR.**

BROACH or BROCHIE. An old English term for a spire of any kind used by WILLIAM OF WORCESTER, in his *Antiquities*, 4to., Bristol, 1834, "spera sive le broche" and by the extracts relating to Louth steeple (1500-15), given in the *ARCHÆOLOGIA*, xi, 70. The term is still used in some parts of England in the above sense; but considerable efforts have been made by recent authors (e.g. RICKMAN, *Attempt*, 8vo., London, 1848, p. 119) to confine the meaning of the term to a spire springing from the exterior walls of a tower without any parapet and gutter; as was usually the case in the First Pointed style, rarely so in the Second Pointed period, and hardly ever in the Third Pointed style. In the narrative of the fire at St. Paul's cathedral in 1561, given in the *ARCHÆOLOGIA*, x, 75, the terms "the broche or shaft", are used where they evidently mean the spire, because of the subsequent phrases "bowl of the shaft" and "broche of the steeple was burnt down to the battlements"; hence it is evident that three centuries ago the term broach spire would have been tautology, and that broach did not then designate any particular kind of spire.

BROACHED or BROCHED WORK. The term applied by masons to the facing done upon an already scapelled stone, to remove the marks of the scappling hammer. **ASHLAR.** The stone is next hewn, i. e. axed with a broad sharp axe, or else wrought with a broad chisel called a boaster. The resulting face, called hewn, or broached axed, is nearly smooth, and ready for rubbing upon sand or gritstone if a fine face is required. This explains "hewing, broching, and scaplyn of stone" in the chapel roll of Durham Castle, 1544, although the *Glossary* suggests that *broching* therein means "cutting the stone in the form of voussoirs". Broached work is also called clean picked, close picked, picked fair, or inch-tooled. When the furrows are produced by a still narrower tool, from three to six eighths of an inch wide on the cutting edge, the result is called chiseled or striped worked; and when a still narrower is used, the result is called pointed work. For both striped and pointed work the stone should be previously *drove*, i. e. faced with the boaster. This, though always done in former times, is now generally omitted by the northern masons, although they might be allowed to execute *drowing* for these two processes with less care than they would give to it if it were to form a finished face. 8.

BROAD AXE, CHISEL, or TOOL. The name given to two sorts of chisels used by masons; one having a cutting edge of $3\frac{1}{4}$ inches, and the other, which is properly termed the **BOASTER**, of 2 inches in width. The former is used in cleaning the marks of the latter by two sorts of operations, called **STROKING** and **TOOLING**, from the face of a stone before rubbing it on sand or gritstone. In working, the tool is kept perpendicular to the side of the stone, and its marks are frequently left without subsequent rubbing. 1.

BROAD STONE. A name given by masons in former times to freestone used for paving, because it was raised from the quarry in broad thin slabs, not above three inches in thickness. 4.

BROCATELLO MARBLE. This term is differently applied in Spain, Italy, and France. Tortosa brocatello (Fr. *brocatelle d'Espagne*) is almost entirely composed of crushed shells, and is therefore properly a *lumachelle*; it has a vinous red ground, covered and marbled by numerous small spots or points of Isabella, yellow-grey, or crystalline-white colour; the

grey spots are shells, which is not the case with the yellow or violet spots and veins; it is procured from a quarry said to have been worked by the ancients near Tortosa, in the province of Catalonia in Spain. A brocatello marble procured at Boulogne in France, has red veins and spots larger than those in the Spanish marble.

Italian brocatello (Fr. *brocatelle de Siéne*) is strictly a large breccia, procured from a quarry about six miles distant from Siena; it has an egg-yellow ground, more or less dark, formed into large irregular spots by veins which are expected in England to be bluish-black, but in France to be vinous red passing sometimes into purple. A fine specimen is said to be supplied from the quarries at Besazio, near Mendrisio in Switzerland.

French brocatelle (Fr. *brocatelle de Moulins*) contains a multitude of organized bodies; it has a bluish-grey ground with brown and golden-yellow veins; it is procured from a quarry discovered in 1760 near Moulins, in the department of the Allier in France.

The ancients procured a brocatello from Adrianople. W. H. BROCHIE, see BROACH.

BROCOLI COLOUR. The term adopted by ANSTED, *Elementary Course*, 8vo., London, 1850, for a colour which is brown, with blue, red, and grey, and of which zircon forms the standard.

BRODSWORTH STONE, from the neighbourhood of Doncaster, is mentioned in the *Builder Journal*, xii, 425, as used in the internal ashlar work of the new church.

BROE (PIERRE JEAN DE), born at Ghent 21 December 1761, was a pupil of D'Huyvetter. His pupil GOETGHEUVER, *Choix des Monumens*, fol., Ghent, 1827, gives, p. 51, a view of the corps de garde at the *porte de Courtray* (1809); and attributes to Broe buildings for similar purposes at the *portes de Bruxelles* and *de Bruges*; a caserne for cavalry and gardes-pompiers; fountains; quays; the old orangery and hot-house in the *Jardin Botanique*; nine swing-bridges; the old *salle* in the museum; the principal façade and organ-buffet to the church of S. Sauveur; the *jubé* and organ-buffet for the church of S. Nicolas; several houses in the rues de Brabant and de l'Université; and the staircase in front of the modern portion of the maison-de-ville, all in Ghent. 97.

BROEBES (JOHANN BAPTIST), a pupil of J. S. Marot, entered the service of the elector of Brandenburg in 1690, and died at Barby, where he had been sent in 1720 to finish the palace commenced by Simonetti. 68.

BROGGIA (GIOVANNI BATTISTA) rebuilt the church of the convent of S. Potito at Naples. 95.

BROUGHTON (JOHN DE) was comptroller of the works at the new chapel of S. Stephen in the palace at Westminster from 1333 to 1340, if not longer; BRAYLEY and BRITTON, *History of the Palace*, etc., 8vo., London, 1836, p. 148.

BRONGNIART, sometimes written BROGNIART and BROGNARD (ALEXANDRE THÉODORE), born at Paris 15 February 1739, studied architecture under Boullée, and was elected in 1781 a member of the Academy of Architecture in that city. He designed the *parc de Maupertuis*; the palaces d'Orléans, rue de Provence (chaussée d'Antin), and Condé (rue de Monsieur); the hôtels Monaco (rue S. Dominique), and de S. Foy (rue Basse du Rempart); baths for the baron de Besenval; the *pacillon* of the order of S. Lazarus; the church and monastery of the Capucins in the rue Ste. Croix (chaussée d'Antin), in 1781, which he altered in 1800 for the Lycée Bonaparte, afterwards called Lycée Bourbon, LEGRAND and LANDON, *Description*, 8vo., Paris, 1808, iii, 51; and the theatre du Louvois, 1791, destroyed 1825. He was architect to the ministère des affaires étrangères, to the hôtel des Invalides, to the école militaire, and to the department of the Seine. KRAFFT, *Plans des plus Beaux Jardins*, fol., Paris, 1809, ii, pl. 4, ascribes to him the design of a house in the rue des Victoires, and at pl. 9, that of a garden at Clichy. Brongniart designed the *bourse*, and laid the first stone 24 March 1808; it was finished without alteration

after his death, which occurred 6 June 1813: he was buried in the cemetery of Père la Chaise. Under his name was published *Plans du Palais de la Bourse de Paris, et du Cimetière de Mont Louis*, fol., Paris, 1814. The hôtel de S. Foy or S. Foix was long considered as a model, and might have served as a standard of Parisian structures of its time; but it was divided under Sobre, in 1798, between two proprietors, according to LEGRAND, iv, 21, who gives an elevation of this building. 45. 84.

BRONTEIUM (Gr. *Βρονταίον*). A vessel by means of which the sound of thunder was imitated in the ancient theatres. The word is generally supposed to have meant the place in which the machine was deposited; but incorrectly, as appears from SUIDAS, s. v.; JULIUS POLLUX, *Onom.*, iv, 180, the scholiast upon ARISTOPHANES, *Nubes*, 293; and EUSTATHIUS; which may be compared with STEPHANUS, *Thesaurus*, s. v. A. A.

BRONZE (Lat. *æs*; It. *bronzo*; Sp. *azofar*; Fr. *bronze*; Ger. *erz*). The mixed metal obtained from the fusion of copper with tin, occasionally with the addition of more precious metals, when it is desired to apply the resulting alloy to the higher branches of art.

It appears that this alloy was anciently more universally known than brass or iron; probably because the treatment of the ores of zinc to make brass, required a more intimate acquaintance with the laws of metallurgy than was necessary for the manipulation of the ores of tin, and of the more generally useful metal, iron; and it is certain that notwithstanding the confusion in the application to pure copper and its alloys of the words "æs" and *χαλκός* (which have been indifferently translated either brass or bronze, whereas *ορείχαλκος* was probably the ancient term for brass), the statues and implements of the ancients were almost invariably obtained from the alloys of copper and tin, so that all specimens of ancient bronze that have been analyzed were found to be composed of 88 parts of copper to 12 parts of tin, and in one case some zinc. The bronze of Delos, perhaps light in colour, seems to have been the earliest in favour; it was rivalled by that of Ægina, but PLUTARCH confesses that its composition was unknown in his time; both mixtures were considered by PLINY, *Hist. Nat.*, xxxiv, 3-5, to be inferior to the *hepatizon* or liver-coloured. The still more celebrated *æs Corinthiacum* was of three sorts: one was called white, from the great proportion of silver which it contained giving it a light colour; in another gold was supposed to be introduced in sufficient quantity to impart a strong yellow tint; and the last was composed of equal portions of the three metals. According to PLINY, xxxiv, 20, a mixture of 100 parts by weight of copper with 8 parts of lead was usual; but an alloy made by the Romans was 66 of new copper with 33 of old bronze and 12½ of *plumbum argentarium*, probably pewter (xxxiv, 48); and another consisted of 100 parts of pure copper, 10 of lead, and 5 of the *plumbum argentarium*; for utensils, 100 parts of copper and 3 or 4 of lead was thought sufficient. VITRUVIUS is silent as to the preparation and use of a metal which must have been of much value in his art, unless a few words in lib. viii, 5, may be considered an exception to this remark.

The precise etymology of the word bronze has not been ascertained; but it is first met with in Italian writers to express this mixture of metals, and it is not very improbable that it is a corruption from the word *bruno* or brown; the bronze of the Italian, and particularly of the cinque cento schools, being of that colour, which is nearly the original one of the material when left in its natural state. The green hue that distinguishes ancient bronzes is produced by oxidation and the action of carbonic acid. The moderns imitate this effect by washing the surface with an acid. VASARI, in his *Introduction*, alludes to the practice even in his time, and to the means adopted, to produce a brown, a black, or a green colour on the bronze: PENNY CYCLOPÆDIA, art. *Bronze*.

According to DUMAS, the proportions of copper and tin found in the various descriptions of bronze are the following:

ARCH. PUB. SOC.

Parts Copper	Parts Tin	Quality of resulting Alloy
100	16½	Greyish-white colour, brittle, only slightly acted on by the file, with a smooth fracture.
100	50	Brittle, white, smooth fracture, forms (heavier than any metal) <i>speculum metal</i> ; see ALLOY; BELL METAL.
100	41	Ditto.
100	25	Brittle, yellowish-white, with granular fracture (BELL METAL).
100	20	Ditto, yellow, same fracture, filed with greater ease.
100	11	Slightly malleable, yellow.
100	11	More malleable, of a more decidedly granular fracture, and more yellow. This is very nearly the result of the analyses above named.
100	12.5	Reddish yellow colour, fine grain.
100	11	Sonorous, granular, easily filed.
100	10	Ditto, but of a redder colour. This alloy is easily worked, and constitutes the <i>gun metals</i> of engineers.
100	9	Alloy often used for <i>cannons</i> .
100	8	Alloy which is susceptible of fine chiseling, and there fore suitable for medals and fine castings.

It also appears that the best proportions to prevent any oxidation of the tin during fusion are 2 equivalents of copper to 1 of tin; to obtain sonority, 8 of copper to 1 of tin; and to obtain a fine yellow colour, 12 of copper to 1 of tin. In casting bronze ordnance, the proportions vary according to the size of the piece. Pieces called eight-pounders, or under, are made of an alloy of 100 of copper to 8 of tin; those of larger dimensions are of 100 of copper, to 10 or 11 of tin. The analyses of metal used for bells shows that it usually contains about 78 of copper to 22 of tin; but a small additional quantity of tin is required during the operation of melting, in order to allow for the volatilization of a portion of that metal. In casting medals, the proportion of tin varies from 4 to 17 to 100 of copper; but the usual range is between 7 and 11, to 100 of copper. BELL METAL. CHISEL.

The Kellers are believed to have given the peculiar and beautiful hue which characterizes their bronzes, by using a quaternary alloy, the precise nature of which has not been accurately ascertained, although it is considered to have been composed of 90 parts of copper, 2 of tin, 1 of lead, and 7 of zinc; proportions which were followed in recasting the statue of Henri Quatre on the *pont Neuf* at Paris, but without success, so far at least as the colour is concerned.

Some of the more generally known ternary mixtures might frequently be used in decoration; and DUMAS particularly mentions an alloy of 100 parts in weight of copper, with 6 or 7 of tin and 6 or 7 of zinc, which he states will yield a compound of a beautiful golden colour, with a very fine grain, very malleable, and easily worked; for no alloy of copper and zinc or copper and tin works so pleasantly on filing, turning, or polishing, as when combined with a small proportion of a third fusible metal. GMELIN, *Handbook of Chemistry*, 8vo., London, 1848, states that the best compound for bronze statues, intended to be subsequently gilt, is a quaternary alloy of 78.5 copper, 17.2 zinc, 2.9 tin, and 1.4 lead; whilst for other bronze castings, it should be composed of 91.25 copper, 5.50 zinc, 2.00 tin, and 1.25 lead. DUMAS, *Chimie appliquée aux Arts*, 8vo., Paris, 1828-46; D'ARCEY, *Mémoire sur l'Art de dorer le Bronze*, 8vo., Paris, 1818; LAPOLIE, *Mémoires Historiques, etc., de la Statue de Henri IV*, 8vo., Paris, 1819. The CIVIL ENGINEER, etc., *Journal*, iv, 217, 259, contains DALY, *Historical Sketch of the Use of Bronze*, from the REVUE GÉNÉRALE, 1841, p. 13; and vii, 34, HOFFMANN, *On Bronze*, who notes a very red bronze for statuary, composed of 88.75 parts of copper zinc (7 of copper to 1 of zinc) to 11.25 parts of copper tin (3 of copper to 1 of tin); and a cheap bronze having a bright yellow colour, almost golden, composed of 93.5 parts of copper zinc (2 of copper to 1 zinc) to 6.5 parts of copper tin (3 of copper to 1 of tin). See also WILKINSON, *Arts of the Ancient Egyptians*, in the LIBRARY OF ENTERTAINING KNOWLEDGE; *Arts of the Greeks and Romans*, in LARDNER'S CYCLOPÆDIA; and URE, *Dict. of Arts*, etc., 8vo., London, 1853. G. R. B.

Six parts of copper to one of tin is stated by BUCHANAN, *Millwork*, etc., 8vo., London, 1841, p. 255, as the most tenacious compound. A proportion very near to this is used for bearings,

R R

bushes, and some purposes in machinery, but it is too hard and brittle for many uses. The French mint returns give the composition of Keller's bronze as copper 82.45, zinc 10.30, tin 4.10, and lead 3.15. Bronze (Fr. *airain*) is also composed of copper 7, zinc 3, and tin 2; or for *ormolu*, copper 72.43, zinc 25.2, and tin 2.65.

W. H.

"This metal", or rather alloy, "from its intractability and brittleness, excessive hardness of surface and facility of fusion, seems to demand for itself a completely different line of treatment from silver. Casting and chasing appear its proper and legitimate province, and it lends itself with singular felicity to the reproduction of the highest order of sculpture. Striking differences of proportion manifest themselves between statues executed in marble and those of which bronze forms the material. In consequence of the dark colour of the latter, every portion of the form, in order to be clearly defined, requires a certain amount of conventional treatment, so as to increase the sharpness and precision of the several forms and markings so as to enable the spectator to appreciate them at that point of view from which he may likewise take in the general outline, upon which the effect of the whole figure depends"; WYATT, *Metal Work*, fol., Lond., 1852, pp. xii, xix, who points out these peculiarities, and further states, "it may be assumed, therefore, that in all large works in bronze extreme simplicity is an indispensable requisite; upon objects of a small scale, this attention is no longer so cogent a necessity; advantage should be taken of every refinement of execution calculated to heighten the effect and texture of the object to be represented." Casting in bronze as practised in the present day, is detailed at p. xxix; in the time of Cellini, sixteenth century, at p. xxx; and ornamental brass work, at p. xxxi.

Besides cramps used for the Roman antiquities and for the works in stone and marble of the gardens at Versailles, mention may be made of the bronze-plated subterranean chamber at Mycenæ, described by DONALDSON, Supp. vol. to STUART'S *Antiquities of Athens*, fol., London, 1830; the bronze shrine of Minerva Chalciæca at Lacedæmon by Gitiadas, about 512 B.C., according to PAUSANIAS, *Description*, iii, 17; the Colossus of Rhodes, 290 B.C.; the bronze doors and inscriptions to monuments of all kinds; the bronze bas-reliefs in entablatures and pediments, as was probably the case at the Pantheon in Rome, which not only had, until the restoration by Septimius Severus, bronze capitals to its internal columns like those of the Corinthian order at Spalatro, but also had bronze-work (removed in 1625 or 1633 and converted into the baldachin of S. Peter's) to the ceiling of its portico, as illustrated by SERLIO, *Architettura*, 4to., Venetia, 1619, p. 52, and recorded by PALLADIO, *Antichità*, 8vo., Rome, 1554, p. 23; the cella Solæaris of the baths of Caracalla, with a ceiling of bronze latticework, recorded by SPARTIAN as inimitable in the opinion of the best architects of his time; the CHALCIECUM of Justinian at Constantinople; the four columns on the altar of the sacrament in S. Giovanni Laterano, said to have belonged to the temple of Jupiter Capitolinus; and the numerous modern columns, fountains, monuments, and statues, especially that of S. Carlo Borromeo at Arona, on the banks of the Lago Maggiore, 1697, the extremities of which are of this material. Essay *On the Effects, etc., of Iron in the Construction of Buildings*, premiated by the Royal Institute of British Architects, and given in the CIVIL ENGINEER *Journal*, vi, 291.

The use of electro-deposition as a means of obtaining statues of pure copper in one piece without seams, as practised at the cathedral church of S. Isaac at S. Petersburg (MONTFERRAND, *L'Eglise*, etc., fol., S. Petersburg, 1820), and the reverse (from molds) of the process, may be usefully applied for the production of architectural ornaments.

BRONZE POWDER. A gold-coloured scaly powder used by painters in the imitation of bronze. It is very soft and glossy to the touch, readily rubbed down between the fingers, and

has a golden metallic lustre when the colour is brought out by a little friction. It has long been chiefly made at Nuremberg in Germany, where the process of manufacture is said to be kept a secret; but it can be manufactured of 12 parts by weight of grain tin, 7 of flower of sulphur, 6 of muriate of ammonia, and as many of quicksilver. A silver-coloured powder is made of 3 parts by weight of grain tin, 3 of bismuth, and 3 of quicksilver; ACKERMANN, *Repository*, 8vo., London, 1816, ii, 262. A common yellow or golden bronze is made solely of copper dust, the finest and brightest that can be got; red bronze is made of the same material, with the addition of a little red ochre well pulverized: both are applied with varnish. To prevent their turning greenish, the work must be dried over a chafing dish as soon as bronzed.

13.

BROOCH. An old term for a painting all in one colour, such as an imitation of a basso-relievo.

4.

BRONZO. The name given at Verona to a hard white calcareous stone, on account of the sound rendered by it while under the process of working. A similar stone used by Palladio and other architects at Vicenza is called by the same name, and is obtained at Chiampio.

107.

BROSIMUM AUBLETII, or B. guianensis, Letter wood (*bourra courra* of the natives). One of the most costly woods of British Guiana and Trinidad. It is of a beautiful brown or bright red chestnut colour, with small rhomboidal black spots, mostly isolated, though occasionally concurrent, which have been compared to hieroglyphics; this spotted part is peculiar to the heart, the only part used, which is seldom more than from 12 to 14 inches in circumference. The tree never attains a large size, but produces a fine, close-grained, rather heavy and hard wood, difficult to work. It is well suited for small cabinet work, picture frames, and veneering.

71.

BROSSE (JACQUES DE), frequently called Desbrosses, built for la belle Gabrielle d'Estrées, mistress of Henry IV of France (1589-1610), the château de Monceaux near Meaux, which was considered to have been his best work: the château of Colomier (properly Colombières) in Brie, given in the little MAROT, and a plan in the large MAROT; in 1616 the façade of the church of SS. Gervais and Protais at Paris, finished in 1621, this served for a long time as a type of church architecture in France; given in the large MAROT, and by LEGRAND and LONDON, *Description*, 8vo., Paris, 1808, i, 73: the palais d'Orléans, called also du Luxembourg, commenced for Maria de' Medici, widow of Henry IV, in 1615, and completed in 1620; but the great staircase towards the gardens is said to have been designed by Marie de la Vallée, and to have been built by Guillaume de Toulouse, this however together with the vestibule and entrance from the gardens, has been since replaced upon a design by Chalgrin, as shown in LEGRAND, ii, 61; this palace is also illustrated in the large MAROT, and by BLONDEL, *Architecture Française*, fol., Paris, 1752, ii, 48; and *Cours*, 8vo., Paris, 1771, iii, 79, pl. 10. He rebuilt before 1622 the great hall of the palais de Justice at Paris, burnt in 1618, LEGRAND, ii, 55; the present roof was added by ANTOINE: rebuilt in 1623 the Protestant church at Charenton, given in the large MAROT as having only two galleries, but it otherwise accords with the description by DEZALLIER D'ARGENVILLE, *Vies*, 12mo., Paris, 1788, i, 331, who says that it was 114 feet long by 72 feet wide, with three galleries, and calculated to hold fourteen thousand persons; it was destroyed 21 October 1685: and his last work was the second aqueduct at Arcueil, finished in 1624; BLONDEL, *Arch. Fran.*, iii, 47. An edition in 1619 of BULLANT'S *Reigle Générale* is attributed to him in SAVOT, *L'Architecture Française*, 8vo., Paris, 1685, p. 352, where he is styled *architecte du roi*. DAVILER, *Cours*, 1760, p. 138, mentions as a design of high merit, attributed to De Brosse, a rustic doorway with an entablature of the Doric order in the rue des Augustins du Grand Couvent.

BROU. The seat formerly of a priory, placed at about 684 yards from Bour, the capital of the modern department of

the Ain, or of the ancient province of La Bresse in France. Marguerite d'Autriche, widow of Philibert II, duke of Savoy, to whom the province of La Bresse belonged, commenced the rebuilding of the monastery, which was placed under the protection of S. Nicolas de Tolentino; and monks of the order of the Augustines of Lombardy were attached to it, according to a bull dated 1506.

The church was commenced in the year 1506 (the foundation stone was laid in 1511), and is said to have been continued without interruption until 1534, under the direction of Louis van Boghem or van Boghedem, who afterwards built the *hôtel-de-ville* at Brussels; the work was finished about the year 1536, perhaps by André Colomban of Dijon, to whom the whole work is sometimes ascribed. Many important repairs and alterations were effected between the years 1659, and 1790. During the great Revolution it was much injured. In 1823, the buildings were transferred to the bishop of Belley and adapted for a seminary; since that period, efforts have been made to prevent the rapid decay to which they had been exposed. The church of Brou is built in a style which may be named the Burgundian later Flamboyant. The plan is a Latin cross; the length of the nave and choir being 235 feet, that of the transept 117 feet 4 inches; the width of the nave including the chapels 95 feet 10 inches; and the height of the main vaulting 66 feet 8 inches in the clear. There is something worthy of examination in the church because it is characteristic of a singular woman, and because it bears the impress of a social revolution. It has been called "a huge piece of Mechlin lace-work carved in stone." Garlands, flowers, embroideries, crockets, finials, cusps, canopies, pinnacles, inscriptions, rebuses, every imaginable caprice in fact, are crowded together in such endless confusion, and executed with such delicacy and upon so small a scale, that they produce an impression of monotonous magnificence. The objects most worthy of examination are the *jubé*; the white marble tombs of Marguerite of Bourbon, of Marguerite of Austria, and of Philibert of Savoy; and the stalls of carved oak. The stained glass is hardly worthy the notice it has received; and the alabaster high altar is evidently a modern though hardly successful attempt to catch the spirit of the original design of the building. The western elevation, *jubé*, retable, and tomb of Marguerite, are given in LE MOYEN AGE, pl. 5, 14, 52, 347, 370; the several tombs in LE MAGASIN PITTORESQUE for 1840, p. 269, and for 1850 p. 20, 116, and 117; views with details by SOMMERARD, *Album*, iii, pl. 4, 23; and LABORDE, *Monuments*, pl. 243, 244, after mentioning that the eleven volumes of accounts amounting to £400,000 are supposed to be still in existence, gives a view of the building and outlines of four subjects in the painted glass; TAYLOR and NODIER, *Voyages Pittoresques* (Franche Comté), pl. 25-34, give views, the tombs, details, and the plan. Many of the details, especially those of the canopies of the stalls, were decidedly composed under the influence of the revived classical taste, even though they retained the arrangement and the outward forms of Gothic art. ROUSSELET, *Histoire, etc., de l'Eglise*, 8vo., Bourg, 1850; MICHELET, *Renaissance*, 8vo., Paris, 1855; and BAUX, *Recherches, etc., sur l'Eglise*, 8vo., Paris, 1844.

G. R. H.

BROUGHTON (JAMES), deputy surveyor of Westminster Abbey, died January 31, 1710, aged 63. SEYMOUR, *Survey*, fol., London, 1735, ii, 577.

BROUSSA or BRUSA (the ancient Προῦσα, and Prusa ad Olympum). A city of Anadolía in Asia Minor, and the capital of the Turkish empire from 1326 until 1453. It was destroyed in April 1855, as reported in the MORNING CHRONICLE *Newspaper*, by a conflagration that followed an earthquake, which laid in ruins all that had escaped when a fire in 1801-2 destroyed half the town. TEXIER, *Description de l'Asie Mineure*, fol., Paris, 1839, i, describes the eight celebrated public baths outside the town; and gives, pl. 15-21 (with a remarkable CAPITAL decorated with acanthus leaves, but belonging to no fixed order), the Ghazi Unklar Djami-si, a mosque at Tchékirghi or Tchekirgué, built by Mourad I. (1358-1389), who also erected the mosque which bears his name; perhaps no other Asiatic town had examples of mosques having two cupolas in the axis of the plan: the tomb of Mourad I; his neighbouring *medresseh* or school; and his great mosque, Oulu Djami, which was only paralleled by that at Casarea; it was square on plan, and has twenty-four cupolas surrounding the space left for a central one of equal size. TEXIER also describes the celebrated Daoud Monastir consisting of a nave and aisles; with a lining of veined grey marble separated by toothed bands; a cupola supported by four grey marble columns; and with apse windows, each of two lights separated by a columnel with the cross on the capital, as a work of a late Byzantine period and originally the chapel of the castle: a chapel belonging to the monastery; the mosque of sultan Bayezced I. (1389-1402), with eight detached turbehs or tombs of the family of that sovereign; and the unfinished Yekel Djami or green mosque commenced by Mahomet I. (1413-1421), whose turbeh, with linings inside and outside of Persian embossed coloured tiles, was perhaps an unique example of that mode of manufacture. HAMILTON, *Researches*, 8vo., London, 1842, i, 71, etc.; LABORDE, *Voyage en Orient, Asie Mineure, etc.*, fol., Paris, 1838, gives a view of the great mosque, and of the interior of the tomb of the sultans.

BROUSSONETIA PAPYRIFERA (*moro papyrifera*). An ornamental wood of Tuscany. 71.

BROUTÉL, Sieur du Val (ANTOINE) was architect to Anne of Austria, queen of France, and mother of Louis XIV: the church of the Val de Grâce at Paris having been abandoned when nine feet out of the ground by François Mansard, it was continued as high as the first cornice by Jacques Lemercier, BLONDEL, *Cours*, 8vo., Paris, 1771, iii, 303; it was continued by Broutel as inspector-general, with Gabriel Leduc under Pierre le Muet, in 1654. 5.

BROWN (LANCELOT or LAUNCELOT), commonly called Capability Brown, born in 1715 at Kirkharle in Northumberland, was originally a kitchen gardener, but became the most eminent landscape gardener of the time, and an architect of country mansions skilful in all that relates to the internal arrangement and accommodation according to the late Henry Holland, who gave to REPTON, *Fragments on the Theory, etc., of Landscape Gardening*, 4to., London, 1816, the following list of works by Brown: the house, offices, lodges, etc., in 1751, and a Gothic church in 1763 at Croome Court, NEALE, *Views*, 4to., London, 1818, v, and a new place at Spring-hill, both in Worcestershire, for the earl of Coventry; the house, offices, and bridge in 1766-74 (pulled down about 1809) at Fisherwick in Staffordshire for the earl of Donegal; additions and new offices to Burleigh in Northamptonshire for the earl of Exeter; additional buildings in 1765 to Prior-park near Bath for Ralph Allen, Esq.; considerable additions to Broadlands in Hampshire for viscount Palmerston, ACKERMANN, *Repository*, 8vo., London, 1826, vi, 126, NEALE, ii; a new house at Benham in Berkshire for lord Craven; a new house, offices, farm buildings, etc., at Cadlands in Hampshire for Robert Drummond, Esq.; a bathing-place at Christchurch in the same county for the earl of Bute; the picture gallery at Corsham in Wiltshire for Paul Methuen, Esq.; considerable alterations at Trentham-hall, Staffordshire, but Holland and others superseded his work, and have themselves been succeeded by sir Charles Barry, R.A., WATTS, *Views*, 4to., London, 1779, 31, NEALE, iv; a house, offices, etc., in 1762, for the earl of Newbury; a large new house in 1765 called Redgrave-hall in Suffolk for Rowland Holt, Esq.; a new chapel at Compton Verney in Warwickshire for lord Willoughby de Broke; large additions at Cardiff castle in Glamorganshire for the marquis of Bute; alterations to the house erected by Leadbetter, with the addition of a court of offices at Nuneham Courtenay in Oxfordshire for Earl Harcourt, NEALE, iii; in 1764 the mansion now called Claremont in Surrey for earl Clive, which with the arrangement of the

grounds cost £100,000 (NEALE, iv, adds that Brown had been often employed to alter houses, but this is said to be the only complete mansion he ever built; and RICHARDSON, *Vit. Brit.*, fol., London, 1802, i, 61-63, giving two plans and two elevations, ascribes the building to Brown and Holland conjointly); additions to the entrance at Warwick castle for the earl of Warwick; several of the buildings in the gardens at Stowe in Buckinghamshire for viscount Cobham; and a new house at Ugbrooke park in Devonshire for lord Clifford; to this list WATTS, 81, adds alterations and a bridge at Chatsworth. Brown became high sheriff of Huntingdonshire in 1770 (his son afterwards represented that county in parliament), and died suddenly in Hertford-street, May-fair, Feb. 6, 1783 (not 1773 as often stated): his portrait was engraved by Sherwin, after Dance: FELTON, *Portraits*, 8vo., London, 1830, p. 154.

BROWN. The warm broken colour produced by the mixture in equal quantities of the three primary, secondary, or tertiary colours; the ancient brown colours seem to have been produced in this manner with perhaps the addition of black, forming the blackish brown colour of which brown-coal is the standard. Brown takes a specific name from any prevalent colour, as orange brown, purple brown, etc., but blue is never allowed to predominate; a tendency to redness is reprobated by the term "foxiness". The principal modern browns are SEPIA; MADDER BROWN; PARROTT'S BROWN; BROWN LAKE or chestnut brown; bone brown and ivory brown, both produced by calcination; PRUSSIAN BROWN; burnt ochre; UMBER; ANTWERP BROWN or asphaltum, Jew's pitch, Egyptian brown, mineral pitch and mummy; CAPPAGH BROWN; MANGANESE BROWN; MARS BROWN; BISTRE; BROWN OCHRE; RUBENS BROWN; Cassel earth, Campanian brown or VANDYKE BROWN; and COLOGNE EARTH. Spanish brown or Tiver is a red ochre; madder brown is a russet.

The above general acceptance of the term has occasioned much confusion; the word "brown" should only be used to denote colours compounded of yellow, orange, or citrine, or any of their hues, with a black pigment. 9.

BROWNING. A process by which, from the use of chloride of antimony, a shining brown lustre is given to articles made of iron. 23.

BROWNISH RED. The term adopted by ANSTED, *Elementary Course*, 8vo., London, 1850, for the colour of which red ochre forms the standard.

BROWN LAKE, also called HIPPOCASTANEUM or CHESTNUT BROWN. A pigment which is prepared from the horse chestnut. It is transparent and rich in colour, being warmer in tone than brown pink, and is very durable in water as well as in oil in which last it dries well. 9.

BROWN OCHRE, also called SPRUCE OCHRE and ochre de rue. A dull coloured yellow ochre. 23.

BROWN PINK. A pigment of a yellow colour. The receipt for making it from *genestella tinctoris* is given in VERTÉ, *Anecdotes*, 8vo., London, 1826, i, 317. As now prepared, it is a vegetable lake produced from French berries, dying woods, or the refuse of the dyers' vats; very fugitive both in water and oil; it is rarely of a true brown colour, but rather a citrine, being an orange broken by green, or a dark yellow somewhat similar to Italian lake, and called *stil* or *stil de grain*. 9.

BROW POST. An old term given to "a beam that goes cross or overthwart." 4.

BROWN'S ITALIAN TILES, see TILES.

BRU, see BRIZOUZ Y BRU (ATHANASIO GENARO).

BRUAND or BRUANT (LIBÉRAL), was one of the eight original members of the Academy of Architecture at Paris, founded in 1671. In that year he designed the first church and the buildings of the Hôtel des Invalides at Paris, which were finished in 1679; the second church and its dome was added by Jules Hardouin Mansard; and the buildings have passed under the altering hands of the elder De Cotte, of his son, and of

Franque; LEGRAND and LANDON, *Description*, 8vo., Paris, 1808, iii, 33; BLONDEL, *Arch. Fran.*, fol., Paris, 1752, i, 191; GRANET, *Histoire de l'hôtel*, fol., Paris, 1736. It is generally regarded as Bruant's only important edifice, although he was constantly occupied in the royal buildings; but LEGRAND, i, 211, ascribes to him the octagonal church of the Hôpital Général de la Salpêtrière; while QUATREMÈRE DE QUINCY, *Vies*, 8vo., Paris, 1830, ii, 360, ascribes to him and Le Vau the whole hospital, which is given to Bruant alone by BLONDEL, *Cours*, 8vo., Paris, 1771, ii, 13, 203; iii, 49; vi, 474. He continued, on the foundations laid by Pierre le Muet, the church of the Augustins Dechaussées. or des Petits Pères, near the place des Victoires, by him it was only raised seven feet above ground, then continued by Gabriel Leduc, and finished by Cartaud (BLONDEL, *Arch. Franç.*, iii, 21) not Artaud, as in the BIOGRAPHIE UNIVERSELLE, which mentions that in the library of M. Pelletier there was a MS. *Visite des ponts de Seine, Yonne, Armançon, et autres faite en 1684, par le Sieur Bruant, architecte du Roi, avec les plans dessinés par Pierre Bruant son neveu*. Libéral Bruand died about the year 1697. 45.

BLONDEL, *Arch. Franç.*, iii, 5, in the description of the plate illustrating the now destroyed front of the Bureau des Marchands Drapiers in the rue des Dechargeurs or des Lavandieres, attributes the design of that frontispiece to him, and fixes its date at about the middle of the seventeenth century; but in the *Cours*, vi, 474, states that it was the production of his elder brother (called Jacques Bruant l'aîné, architecte du Roi, by D'AVILER, *Cours*, 4to., Paris, 1738, p. 37 and index), who was therefore probably the father of Pierre abovementioned, and Jacques Bruand the younger.

BRUAND or BRUANT (JACQUES), architecte du Roi, is called Bruand fils in the registers of the Academy of Architecture at Paris, of which he was admitted a member in 1699; but BLONDEL, *Homme du Monde*, 8vo., Amst., 1774, ii, 313, calls him a nephew of Libéral Bruant. In Mariette's edition of D'AVILER, *Cours*, 4to., Paris, 1738, pl. 63 V, p. 227, there is a description and illustration of a staircase by him at the hôtel de Matignon; and BLONDEL, *Arch. Franç.*, fol., Paris, 1752, i, 286 (who there calls him the son of Libéral), illustrates with six plates the hôtel de Belle-île, in the rue de Bourbon, constructed by him in 1721. He preceded Courtoune as professor in the Academy, and was one of the best profilists that had appeared in France after Mansard. He died in 1732. 45.

BRUCE of Balaskie (SIR WILLIAM), second son of Robert, third baron of Blairhall, was made a baronet in 1668; he is mentioned under the date of 1660 as "clerk to the bills", and under the date of 1671 as "his majesty's surveyor" and "master of the king's works", being then engaged on the buildings at Holyrood house near Edinburgh, commenced in 1670 and finished about 1679, but not altogether upon the designs of Bruce, who built in 1685 his own house of Kinross. ADAM, *Vitruvius Scoticus*, fol., Edinburgh (1720-40), illustrates the former in pl. 1-5, and the latter in pl. 61-62; and Harden house in the county of Teviotdale in pl. 142. CAMPBELL, *Vitr. Brit.*, fol., London, 1767, ii, 75-77, gives Hopetoun house, commenced in 1698 and finished about 1702, but since built over by W. Adam. KINCAID, *History of Edinburgh*, 12mo., Edinb., 1787, p. 93, says, "a plan of a bridge across the North Loch was drawn by sir William Bruce of Kinross, and is supposed to be lying in the Exchequer here." He died in 1710.

BRUCER (JACOPO), an Italian mode of writing the name of Jacques de BREUCK.

BRUENN (in Slavonic BRNO). The capital of the department of the same name, and since 1641 of the province of Moravia in the Austrian Empire. It is fortified with high walls having four gates, and by the celebrated fortress prison called the Spielberg. The town consists of regularly built houses in crooked but well-paved streets, and in seven places ornamented with marble and bronze fountains.

The cathedral, dedicated to S. Peter, is only remarkable

for the great height of the nave; there are several other churches, of which the most interesting are those of S. Jacobus, 1314-1480, with a steeple said to be 276 feet high, and the tallest in Moravia; and that of the Minorites with its adjoining Scala Santa, and the Augustinian and Capuchin chapels. The other buildings of importance are the episcopal palace; the *landhaus* or *dikasterialgebaude*, containing the governor's residence and his offices, as well as the place of assembly for the estates of Moravia, which was built in 1737 as an Augustinian monastery of the highest rank; the military hospital, formerly the chapel of a Præmonstratensian monastery; the military palace; the barrack, having seven courts, which was formerly a Jesuit college; the *rathhaus*, or town-hall, 1511; the theatre with its assembly room; and an obelisk 60 feet in height (1818). It has several large educational establishments with good museums and libraries, many charitable institutions, and the usual civil, ecclesiastical and criminal tribunals with their prisons. Brunn also contains the splendid mansions of the Zierotin, Kaunitz, Dietrichstein, Lichtenstein, and other families.

W. H.

BRUGES (Flemish *Brugge*). The capital of the province of West Flanders in Belgium, and once the leading city of the Hanseatic league. The streets are generally straight, well paved, and afford fine and curious specimens of Mediæval domestic architecture, and its modifications to the present day; some of which are given by SCHAYES, *Hist. de l'Arch.*, iv, 90-92.

The cathedral, dedicated to S. Sauveur, was rebuilt 1116-27, and renewed after the fire in 1358; Messrs. W. Chantrell and Buyck, 1839-47, renewed the roof, and added two stories with four turrets on each story to the Romanesque tower. The five large chapels at the apse, in the style *Flamboyant*, were vaulted in 1526-38. This edifice is perhaps the oldest brick building of the middle ages existing in Belgium, and is remarkable for its tombs, wood, and metalwork. The church of Notre Dame is said to be 270 feet in length, having a choir (1119-20), a nave and four aisles (1180-85), external chapels dating from the fifteenth century, and the vaulting of the nave 1762; but SCHAYES, iii, 168, admitting the external aisles to be of the twelfth century, considers the others to be chiefly of the thirteenth and fourteenth centuries. The date of 1522-24 is given to the octagonal brick spire of the tower (1230-97), which is the largest brick tower in Belgium, and is now under repair; the whole height of the spire from the ground is said to have been 393 ft. 6 ins., but it was shortened 50 feet in 1818. The building contains the celebrated tombs of Charles the Bold (1558), of his daughter Mary (1495), and that of Adrian de Haverbeke; the pulpit; the confessionals; the oratory of the family called De Gruuthuyse; the *jube*, and a fine sepulchral brass; BEAUCOURT, *Descr. de l'Eglise*, 4to. S. Jacques, consecrated 1469, has the choir and aisles ending in five-sided apses; the tabernacle behind the high altar (1593), other carvings, three remarkable sepulchral brasses, and the old altar in the south aisle, are worthy of notice. S. Walburge, dating early in the fifteenth century, formerly belonged to the Jesuits; the white marble communion screen and the pulpit attract attention; it has no aisles. Ste. Anne, late and modernized, is visited for its *jube* (1642); the confessionals (1677); and other carvings. The Jerusalem church, 1435, is remarkable for a square choir with the angles cut off and carrying the tower, which is finished in timberwork; and for the square nave, and lateral steps to the altar. S. Donat, 1619-41, 210 ft. long with its tower, and 88 ft. 6 ins. wide, was formerly the chapel of the Jesuit college, and has been converted into a barrack and an *athénée*; the pulpit is one of the best of its class. The church of the Madeleine was built during the present century; the old church of the same name is the chapel of the *école des pauvres filles*. The celebrated chapelle du S. Sang was rebuilt 1150-87; the front built in 1533 in the *Flamboyant* style was reconstructed in 1824; *Moyen Age Pittoresque*, pl. 13. The *couvent des dames Anglaises* (Augustinians) has a chapel by Pulinx, 1736-39; and the Carmelite and Capucin monasteries deserve attention;

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the first was built in 1647, its chapel, built by Théodore de Haze in 1688, has no aisles; the other contains some remarkable confessionals and other woodwork. The Béguinage, only inferior to that at Ghent, has a picturesque chapel, as have also the convent of the Assumption and the monastery (1841) of the Redemptionists. The modern abbey *des Dunes* retains its chapel, used by the *seminaire* that has occupied since 1833 the conventual buildings; it is given in SCHAYES, iv, 221, with the dates 1775-88; but STAPPAERTS, i, 93, 94, affirms that the chapel was commenced in 1628, and that the continuation of the other buildings was suspended in 1645; the pavement of the church is remarkable.

Among the charitable institutions, are the hospice and chapelle de la Poterie (1358); the hospice de S. Jean, with its great hall of a late Romanesque style and boldly vaulted; and the *école de l'abbé de Foere* for two hundred girls, having a pretty chapel, of the Doric and Ionic orders with galleries, built in 1830-3 by M. Cools; it is given by STAPPAERTS, i, 91; and occupies the site, but only one *tourelle* remains, of the palace inhabited by the princes after they had quitted the *bourg*.

The *halles*, commenced 1284, is an isolated block 275 ft. 6 ins. long by 142 ft. 9 ins. wide; the wings to the tower were executed in 1364-83; and the back part, with the lower openings of the façade, is in the style *ogival tertiaire*. The architect of the *halles* in 1291, when the *tour des halles* or *du beffroi* was commenced, was Simon de Genève: the *beffroi* had a spire burnt in 1493, and in 1741 when it was 64 ft. high; this was replaced by an open parapet in 1822; *Moyen Age Monumentale*, pl. 117. The first stone of the *hôtel-de-ville* on the *bourg*, was laid in 1377, and the building is the only remarkable one of its class built in Belgium during the fourteenth century; the front is 86 ft. 3 ins. long by 62 ft. 9 ins. high, exclusive of the three *tourelles* at the back and front. The interior is celebrated for its carved and painted wooden ceiling (1398) to the library. The *palais de justice*, formerly the *tribunal du Franc-de-Bruges*, was built in 1521-23; as a new façade was built in 1722 by Verkruijs, only the old back front is visible, its three gables separated by pinnacled turrets are seen from the *quai des Marbriers*; the ceiling is in the Renaissance style, and the chimneypiece dated 1529, is geometrically given in the *BUILDER Journal*, v, 38; DE HONDT, *Notice sur la Cheminée*, 4to., Ghent, 1840. The pretty *bureau des Douanes*, formerly the *poids publics*, a building of the fifteenth century, near the Academy; the *halle aux serges* (1441), formerly the consular house of the Genoese; the large episcopal palace; the fish market (1821) by M. Calloigne; the abattoir (1843-6) by M. Buse, considered one of the best in Belgium; the railway station, *BUILDER Journal*, viii, 246; the old *bourse*, originally the hotel of the family Van den Buerse, whence every exchange was called 'bourse', still existing as it was reconstructed about

1473 and changed in 1833; the new *bourse*, placed in 1675 in the *hôtel de Bouchoute*; the prison, an almshouse, and two convents, close the list of public buildings of interest. The entire east end of the *grande place* is occupied by a building erected 1787.

The city has had since 1358 a corporation of painters, sculptors, and architects; the present *académie des beaux arts* has occupied since 1791 the buildings of the *poortershuis* (*loge des bourgeois porteurs d'armes*), originally built about

1500; this edifice with the hô-



tel of the Company of Archers of S. Sebastian (here illustrated by Mr. Edward Trotman) also offers examples of elegant

s s

tourelles. Several of the buildings which have disappeared are represented in the following works: SANDERUS, *Flandria Illustrata*, fol., Hague, 1641-4; RUDE, *Monuments de Bruges*, 1824; GRAMAYE, *Antiq. Brabantiae*, 4to., Brussels, 1610; DAMHOUDERUS, *De Magnificentia, etc., Brugarum*, fol., Ant., 1563. DELEPIERRE, *Album*, fol., Bruges, 1837, giving (ii, 25) the positions of the remaining guildhalls; his *Guide*, 12mo., Bruges, 1837; the works by STAPPAERTS and STROOBANT; GAILLIARD, *Révue Pittoresque des Monuments qui décoraient autrefois la Ville*, 4to., Bruges, 1850; his *Ephémérides*, 8vo., Bruges, 1847; NASH, *Architecture of the Middle Ages*, fol., London, 1838.

The gravestone pavement of the fine but partly ruined church at Dammes, of the thirteenth century, is a curiosity; the church and the *hôtel-de-ville* are given in DELEPIERRE, *Album*, ii.

BRUGES (PETER DE), clerk of the works at the palace of Westminster in 1347 by SMITH, *Antiquities of Westminster*, 4to., London, 1807, p. 179: but it is inferred that he was the deputy of Walter de Weston in the works of the chapel of S. Stephen, by BRAYLEY and BRITTON, *History*, 8vo., London, 1836, p. 148.

BRUGNOLI or BRUGNUOLI (LUIGI), an engineer, had two sons, who were practising with repute in the lifetime of VASARI. The elder, BERNARDINO, rebuilt at Verona the campanile designed by his relation Sanmichele for the duomo; continued that commenced by Sanmichele for the monastery of S. Giorgio; executed the high altar (MAFFEI, *Verona Illustrata*, 4to., Venezia, 1792, iii, 169); and erected the principal chapel, described in very laudatory terms by VASARI, s. v. *Sanmichele*, both in its church; and continued the round church of the Madonna della Campagna near Verona, which had been commenced by Sanmichele in the year of his death, 1559.

BRUINSMA (ABRAHAM), born at Leeuwarden about 1760, and studied in his native place, as well as at Paris. He was appointed town architect at Sneek in Friesland, where he rebuilt the north choir of the church of S. Martin; he afterwards resided at Leeuwarden, where he designed and built the palace of the governor of the province. He died in the beginning of the nineteenth century. 24.

BRUNELLESCHI (FILIPPO DI SER), see LAPPI (FILIPPO DEI).

BRUNELLI (GIULIO) executed the portico in the piazza, and at one extremity of it the palazzo pretorio at Isola Dovarese near Cremona. 57.

BRUNSBURG or BRAUNSBURG (HEINRICH) of Stettin, built or continued the *Catharinenkirche* at Brandenburg, one of the most important of the splendid buildings of the middle ages (begun 1401). He was also employed at Prenzlau and at Dantzig. HEFFTER, *Beschreibung der kirche*, 1842.

BRUNSWICK (Ger. BRAUNSCHWEIG). The capital of the duchy of the same name in the north-west of Germany. The clean and regular streets contain many picturesque specimens of timber and other old houses, dating from 1488. In the cathedral square is a rich bronze fountain erected in 1408. Some of the churches are remarkable for having the flanks constructed with gables over each bay, and two western towers with a high screen or gable between, at least twice the height of the nave adjoining. The cathedral (1173-1250), dedicated to S. Blaize, has five aisles, three eastern apses, and two octagonal western towers. A south aisle was added in 1300-44, and a north aisle about 1466. The altar in front of the *jube* is said to be of Purbeck marble on five bronze pillars. Of the nine other churches, the leading ones are S. Catherine, with the bottom story of the towers and the nave 1173, the aisles and upper portion of the towers 1252, the belfry 1280-1300, the completion of the towers 1379, the east aisle of transepts 1450, the apse 1500, the glass 1553, and monuments of the sixteenth century (KALLENBACH, *Album*, 4to., Munich, 1846, dates it 1215); S. Martin, with a crypt 1172, tower, nave, and transept 1180-90, Pointed aisles 1250-80, apse 1490-1500, and choir

1617, the south-west chapel of S. Anne like a large oriel, with the bronze font, both date 1434-41, the pulpit belongs to the end of the sixteenth century, and the high altar to 1725 (SCHMIDT, *Die S. Martin's kirche*, 1846; KALLENBACH, 1175-90); S. Andrew, with Romanesque nave and lower portion of towers commenced in 1200, and continued 1360-1420, south tower finished 1518-32, with one of its steeples 316 or 318 feet in height; S. Michael, commenced in the twelfth century, with a nave and tower 1278, a north aisle 1378, a south aisle of the fifteenth century, the three aisles are of equal height. Plans of all these are given in SCHILLER, *Die Mittelalterliche Architectur Braunschweigs*, 8vo., Brunswick, 1852, as also those of two monasteries, the Benedictine (S. Egidius or S. Giles) 1278-1434; and the Franciscan (S. Ulrich), with a choir dating from 1345, and the nave (which has an attached south cloister) from 1375-1451. The church of S. Magnus has a tower and nave 1252, aisle 1290, choir 1447; that of S. Bartholomew bears date 1300; and that of S. Peter, with a tower 1256, but the church 1292. The *Pauliner kirche*, consecrated 1343, with nave and aisles of equal height, is now the *zeughaus* or arsenal, and contains the museum. The *burg Tanquerode* (1172), used as a barrack since 1808; the *Altstadtrathhaus*, partly built 1250, decorated 1393-6, partly built 1393-6 and 1447, and finally decorated 1455-66, a portion is given in the *Civil Engineer Journal*, xiii, 281, *Architect Journal*, ii, 391, and by KALLENBACH, 1325; the *Neustadtrathhaus*, 1422; the *Gewandhaus* or cloth hall, 1270-80; the dual palace rebuilt by Ottmer since 1830-39; the *Stadthaus*; the chapter house; the theatre; and the usual government buildings, such as the mint, the exchequer, and the chancery, are the only structures of importance, except a cast iron obelisk 60 feet high (1822); the city also possesses nineteen asylums and hospitals, and five large schools, inclusive of the Caroline college built in 1746. SACK, *Alterthümer der Stadt*, with illustrations, Brunswick, 1841; SCHROEDER and ASSMANN, *Die Stadt*, 12mo., Brunswick, 1841; LANGE, *Ansichten von Deutschland*; and the BRAUNSCHWEIG MAGAZIN.

The curious church at Melyerode (1180-90), given by KALLENBACH, 1040-50, should be visited, as well as the Cistercian abbey church at Riddagslausen, consecrated 18 June 1278, KALLENBACH, 1215-20; a plan given by SCHILLER shows it as a basilica with a cloistered atrium in front.

BRUNSWICK BLACK VARNISH. A mineral pitch dissolved in spirits of turpentine; forming a good black paint for ornamental iron work.

BRUNSWICK GREEN. A carbonate of copper treated with chalk or lime; but the Continental preparation is said to be an ammoniac muriate of copper, and is used in distemper and oil. An imitation is made of chromate of lead with a blue colour, which will not stand. 9. 23.

BRUNTON'S VENTILATOR. A modification of the fan, being a hollow drum, say 22 feet in exterior diameter, with radial compartments, D, of 6 feet in length, through which the air is discharged with that degree of force which is due to the velocity with which the drum may be made to revolve by the spindle, C: taking 16 feet as the mean diameter of the compartments, moving at a hundred and twenty revolutions per minute, the amount of rarefaction produced is asserted to be three times as much as that from the best furnace. Further calculations and illustrations are given by BRUNTON, *Ventilation*, London, 1849. A, the section; B, the plan.

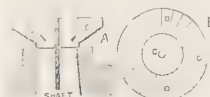
BRUSA in Anadolia, see BROUSSA.

BRUSCA (JACOPO), an Italian mode of writing the name of JACQUES DE BREUCK.

BRUSE, see BRADSE (EGIDIUS or GILES DE).

BRUTI (OTTAVIO), see REVESTI BRUTI (OTTAVIO).

BRUXELLES (English BRUSSELS). The capital of the kingdom of Belgium. The fortifications were destroyed 1818-



40, but an iron railing surrounds the town, and encloses *boulevards* lined with a row of fine houses facing the suburbs. Of the fifteen gates, the arsenal, called *de Hal*, 1381, now contains the museum of antiquities in three large rooms. The older part of the town is situated at the foot of an acclivity; on the top is the modern portion and its suburbs, surrounding the *parc*, which is 1770 ft. long and 1246 ft. wide, formed by Guimart in 1774. The houses are of brick, laid in English bond and plastered to stone screeds with lime and hair, or laid in Flemish bond if not plastered.

The *grande place* contains the hôtel-de-ville, the east end built by Jacques van Thienen 1401-9; the tower, 329 ft. 9 ins. high, with a figure of S. Michael 13 ft. in height, was built by Jean van Ruysbroeck 1444-54, twenty-six feet was rebuilt during the repairs in 1842-55, and the west end in 1444-87 by Herman Gheerys; the back part was erected 1706-17 under Corneille van Nerven; WATERS, in the *Messenger des Sciences*, 1841, pp. 205-48; the large and rich saloons were restored in 1825; *Moyen Age Pittoresque*, pl. 157. The old guildhalls in the *grande place* date about 1706-17; there are six on the west side, one on the north, and two on the south which were restored like some of the others about 1844. The east side of the *place* was built in 1698. The *place Royale* and its eight blocks of buildings were built by Guimart or Guymard; the *place de la Monnaie* was formed in 1819; the *place des Martyrs* in 1775, by Fisco; the *place du Congrès* by M. Poelart is modern; the other *places* are less remarkable: but nearly all contain good buildings, such as the entrance of the old convent called Jericho in the *vieux marché aux Grains*, the new market-place of the same name (1787), and the *place Rouppe* (1840). The *rues, Royale* (1774-1829), *de la marché aux Herbes, Neuve, de la Madeleine*, and *de la Régence*, deserve examination. A *passage* called the *galerie de S. Hubert*, 1846-7, is 698 ft. long and crossed by two streets; it is 26 ft. wide by 59 ft. high, and is attributed to M. Chluisenaar.

The principal church, often called the cathedral, dedicated to SS. Michel and Gudule, is about 360 ft. long by 164 ft. wide, it was rebuilt about 1220; the apse of this date is Transitional in character; the choir, the north transept, and part of the south transept next the choir, are in the *style ogival primaire* of 1273-80; the nave up to the windows, and the north aisle, are in the *style ogival secondaire* of the fourteenth century; the upper part of the nave, the south aisle, part of the south transept, and the two western towers, 226 ft. high, are in the *style ogival tertiaire* of the fifteenth century; the doorway of the north portal dates from 1500 (SCHAYES, *Hist. de l'Arch. Belg.*, 12mo., Bruxelles, 1850, iii, 142); Gilles Vandenberg, Henri de Mol, Jean van Ruysbroeck, and Jean vander Eycken, were successively the architects. Pierre van Wyenhoven designed the attached chapel of S. Sacrement, 1533-9. The corresponding chapel of Notre Dame de la Delivrance dates 1649-53; and that of Ste. Marie Madeleine, by Léon van Heil, 1675, the altar therein came from the abbey of la Cambre. The fine old glass, 1528-57; the pulpit, 1699; the fence around it, 1780; the tombs, 1596-1610; the *jubé*, 1835; the confessionals (HAGHE, *Sketches in Belgium*, fol., London, 1840), and the modern glass, should be noticed. The front shown in the *Moyen Age Pittoresque*, pl. 158, has been cleared; the new range of steps concludes the restorations commenced in 1839.

The other chief churches are:

Name.	Date.	Architect, etc.
S. Catherine .....	.....	with a skillfully executed tower.
S. Jacques sur Coudenberg .	begun 1770 by Guimard, and finished 1785 by Montoyer.	
aisles added	1843-5	
hexastyle Corinthian portico	1777	with columns 34 ft. 6 ins. high.
fresco in pediment	1851	
SS. Jean & Etienne of the Minims	blt. 1700-15	The conventual buildings are now a military hospital.
S. Jean Baptiste of the Beguinage	1657-70	Façade by W. Coeberger.
S. Nicholas	enl. 1200-1300	with choir askew; its tower, the original beffroi de-ville, was built in the fourteenth century, repaired 1714, and fell in that year.

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Notre Dame de Finisterre ..	reblt. 1700-12	repaired 1842.
the dome added	1828	Façade finished at top 1830.
Notre Dame de la Chapelle .	about 1216 as to choir and transepts, which deserve study as marking the transition from Classic traditions to Pointed usages. Fourteen pillars of the nave have statues of a late period. The great window of north transept, the chapels, altars, nave, and aisles, belong to the fifteenth and seventeenth centuries; the high altar erected in 1617, when the choir was altered; the choir chapel of the S. Sacrement was added in 1634.	
Notre Dame des Bons Secours	.....	Jean Courtvriend.
nave 1660; choir 1608; façade 1672; fine dome.		
Notre Dame des Sept Dou- leurs of the Riches Claires	1605-71	
Notre Dame des Victoires	blt. about 1304 as to south portal and three-sided apse; north transept portal about 1400-20; five- niled nave 1450-1235 (?)	lately much repaired; sacristy 1840 by M. de Man. The richest church in the city for works of art. The two choir chapels afford good studies of lighting and decoration.
Church of the Augustines, now used for concerts, &c.	blt. 1620-42	rest. 17-2, 1828, — Coeberger.
Chapel of Ste. Marie Madeleine, or of the Frères de la Doctrine Chrétienne ..	1840	Léon Suys.
Chapel of the Jesuits	1830-50	commenced by Megang with Ionic order in interior; façade by Melotte with Doric order.
The synagogue in the rue de Bavère was formerly a theatre built in 1756.		

The *palais royal* has a façade 393 ft. in length; the wings, 1784, were separated by a street which is now filled up by a centre of six monolithic hexastyle Corinthian columns, by MM. Henri and Suys, 1827-9. The detached stables in the rue de Namur occupy the old arsenal of the fourteenth century. The *palais du prince (d'Orange)*, 1823-6, by M. Vanderstraeten the elder, has a façade of Ionic pilasters; the plan is remarkable for symmetry; the ball room, lined with Carrara marble, is lighted from above; the interior decorations were by M. Suys. The *palais de la nation* contains the hall of Representatives, and together with the staircases offers many features for study; the hall of the Senate was built in 1849; the portico, 1779-83, by Guymard; it stands between the offices of the cabinet ministers, built 1779, forming a fine façade fronting a south aspect; the neighbouring *hôtel du conseil privé* is by Dewez. The *palais de justice*, formerly the college of the Jesuits, is larger than any of these buildings; its octastyle Corinthian portico of twelve columns, is by François Werly, 1818-23. The courts in the interior are richly decorated, and the archives of the kingdom occupy the remainder of the group. The *poëds de la ville* was erected 1706 by Van Nerven; the mint, of the seventeenth century, was partly reconstructed 1820-1; and an adjoining building serving as the *bourse* dates from 1827.

The *palais de l'université* has occupied since 1842 an edifice having a façade designed in 1771 by Dewez; the upper primary school attached to it was built by Van Oyen or Noye in the sixteenth century, but this beautiful specimen of Renaissance architecture, formerly the palace of cardinal Granvelle, 1559, was nearly destroyed by fire 12 August 1825; the military school since 1838 has occupied the old buildings of the abbey of Coudenberg; the *collège Thérésien* was erected by M. Sendrier; the observatory, 1827, is not yet fully occupied. Many other educational establishments have architectural interest. The hospitals are numerous, and deserve attention.

The museum is in the buildings called the *ancienne cour*, the residence of the governors general of the Pays Bas after 1731; the old chapel, 1516, remarkable for its three slight pillars and the decoration of the east end, belonged to the *hôtel de Nassau*, built in 1481, of which a portion rebuilt 1502 still forms one side of the courtyard; the modern chapel, 1760-70, is by Folte, who erected, 1750, the entrance buildings containing the circular vaulted vestibule and staircase, and the other apartments, now the library: the long picture gallery was rebuilt 1829. The new portion of the museum, called the *palais de l'Industrie*, was built in 1829; the cellars contain the casts belonging to the Royal Academy of Arts; the royal library and the *Conservatoire des Arts et Metiers* are above them.

The Botanical Garden has large and magnificent hot-houses built by Suys since 1826. The *grand-théâtre*, rebuilt 1817-21 by Damesme, has an octastyle portico of the Ionic order; the interior was burnt 21 January 1855, and the whole of the edi-

fice is being restored by M. Poelart; there is also the *vaudeville*, 1845, by M. Cluysenaar; the *cirque*, 1846; the *opera comique*, 1847; the *nouveautés*, 1844; that in the *parc*, with its Vaux-hall or café, both by Montoyer; the *salle* of the *Société Royale de la Grande Harmonie*, by M. Cluysenaar, in 1842; and that of the *Société Philharmonique*, by M. Spaak, in 1843.

The new unfinished station of the *chemin de fer du Nord*, by M. Cophens; the *entrepôts*, one built 1780, the other by M. Spaak 1844-6, serving in 1847 for the *exposition des produits de l'industrie nationale*; the hall of the *marché de la Madeleine*, 1847, by M. Cluysenaar; the *marché aux Poissons* and the *marché à la Volaille*, by M. Roget, in 1825; the largest *boucherie*, rebuilt 1695; the *hôpital S. Jean*, 1838-41, and the *grand hospice*, 1824-8, both by M. Partoes; the *maison de détention*, 1813-9, by Damesme; the adjoining *prison cellulaire*, in the Tudor style; the barrack called the *petit-château*, 1848-55, deserve attention; the three other barracks and the gas factory occupy the sites or buildings of monasteries.

Of less public character are the *hôtel de Merode* in the place du petit Sablon, 1555-1598; the *hôtel de Ravestein*, given by SCHAYES, in the *Messenger*, 1849, p. 113, and the *synagogue*, as it is called, opposite to it, both in the rue de Terarcken; the *hôtels d'Arenberg* and *d'Urseel*, both erected by Servandoni; the *maison au pain* (broodhuis) or *maison du roi*, opposite to the *hôtel de ville*, and designed by Antoine Keldermans, but executed after his death in 1516 by Louis van Bodeghem or Beughem and Henri van Pede, who finished it in 1531: it was ornamented in 1625, repaired in 1695, restored in 1763, and again in 1841, by the club called *Société de la Loyauté* (WALTERS, in the *Messenger*, 1842, p. 1); six statues and four fountains, with many private dwellings of modern date, afford ample materials for study.

The *fauzbourgs* are equal in population to half the city; these, taken in order, consist of Schaerbeek only twenty years old, with a church dedicated to Ste. Marie, in the Byzantine style, by M. van Overstraeten Roclandts, 1850, given in his *Architectonographie des Temples Chrétiens*, 8vo., Ghent, 1850; that to SS. Jean and Nicolas, 1835, and the houses of the late marquis de Cazo and of the architect Suys; the Gothic parish church was enlarged in 1840: S. Josse-ten-Noode with its little church, two neighbouring châteaux, and three cemeteries: Leopold, commenced 1838, with fine private houses and a church to S. Joseph, 1850, by M. Suys, erected of the *pierre bleue* in the Italian style with nave and aisles of equal height, entrance between two towers, and good Renaissance stalls: Ixelles, with a brick church by M. Dumont dedicated to S. Boniface, in the Flamboyant style, having three aisles equally high; the abbatoir; the *maison communale*; and the vast Cistercian buildings of la Cambre, since 1811 a *dépôt de mendicité*: Louise: S. Gilles, with a church built in 1756, enlarged 1823; and the factory in the monastery de Forêt, having the curious black marble slab and effigy "*en creux*" of Ste. Alène: Anderlecht, with a church, formerly collegiate, in the style *Flamboyant*, built 1470-1526 by Jean van Ruysbroeck, and containing many fine tombs: Molenbeek, with a new church by M. Spaak 1843: and Laeken with its collection of villas round the church built in 1200, and restored 1601, and the monuments in its burial ground; the palace built 1782-4 from the designs of the duke of Saxteschen, then governor-general of the Pays Bas, and carried out by Montoyer; and the barrack facing it. In the vicinity of Brussels there are very many noticeable places and edifices, particularly Halle and its church. *Description*, 12mo., Bruxelles, 1743, and another in 1782; ROMBERG, *Brussels and its Environs*, 12mo., London, 1816; the works by LE ROY, and by CANTILLON; HENNE and WALTERS, *Histoire de la Ville*, 8vo., Brussels, 1845; WALTERS, *Brussels et ses Environs*, 12mo., 1855; PUTEANUS or PUY, *Bruzella Septenaria*, fol., Brussels, 1646; STAPPAERTS, *Belgique Monumentale*, 8vo., Bruxelles, 1844. A plan of the city is given in the maps of the Society for the Diffusion of Useful Knowledge.

BRUYÈRE (LOUIS) born at Lyons in 1758, occupied various posts in the administration of the *Ponts et Chaussées*, and was nominated in 1809 a member and in 1816 an officer in the Legion of Honour, *maître des requêtes* in 1810 and in 1821, and architect to the city of Paris in 1811; where he directed the construction of the five abattoirs, *du Roule*, *de Ville Juif*, *de Grenelle*, *de Mémil-Montant*, and *de Mont-martre*; also the markets *du Temple*, *de S. Honoré*, *de la Volaille*, *de S. Germain des Prés*, and *des Prouvaires*, and the *entrepôt général des vins*, which by their peculiar character form an epoch in the construction of such works. He published *Études relatives à l'Art de Construction*, fol., Paris, 1822, etc., which contains illustrations of some of the above buildings. He died 3 December 1831. NAVIER, *Annales des Ponts et Chaussées*; JULLIEN, *Recue Encyclopédique*, lii. 84.

BRYA EBENUS (*granadillo*). A very dense wood of Cuba. 71.

BRYDEN'S PATENT METALLIC ROOFS AND JOISTS. The patentee, in his specification, enrolled 6 January 1844, claims the mode of constructing metallic roofs by employing iron rafters with grooves to receive metal plates or iron laths; and of constructing wrought iron rafters and joists with grooves for wood. WELDING. The details are given in the *CIVIL ENGINEER Journal*, vii, 35.

BUBILE (*Stabulum* understood), also called BOVILE. The Latin term used in old authors for an ox-stall.

BUBLOS in Phœnicia, see BYBLUS.

BUBROMA GUAZUMA, bastard cedar. A tough but not durable wood of the West Indies. 71.

BUCHAREST, see BUKAREST.

BUCHSBAUM (HANS or HANSEN) in 1425 or 1429 became *baumeister* of the cathedral of S. Stephen at Vienna, finished the spire of the southern transept tower in 1433; designed the pulpit, and commenced the north tower in 1450. The choir, 1359, was continued by him until his death in 1454. There is a bust of this architect under the pulpit, and a larger one close to the organ. TSCHISCHKA, *Der Stephansdom*, fol., Vienna, 1832; and *Die Metropolitankirche*, 1843. 26. 92.

BUCIDA BUCERAS. A coarse-grained strong wood of Trinidad called *olivia*, principally employed for shingles. The diameter of the tree varies from two to four feet. B. capitata is a very dense wood of Cuba, and is called *jucaro*. 71.

BUCK BASKET, see BACK BASKET.

BUCKLE (Fr. *boucle*). An ornament formed by a circular strap, like a ring of leather glued on an astragal or torus, in the manner of a guilloche. 5.

BUCKLE (Fr. *boucler*). A wall is said to buckle when it bulges on account of the facework separating from the body of the wall, or when the wall splits and bends inwardly as well as outwardly from too great pressure above, or from defective construction. 5.

BUCKLED PLATE IRON. An iron plate stamped with a groin. A variety of corrugated iron plate used for covering roofs. MAILLET'S ROOF PLATES.

BUCKTHORN. A wood of America, see RHAMNUS.

BUCKUM, BOOKUM, or SAPAN-WOOD, see CÆSALPINA.

BUCRANIUM (Gr. *βοῦκρανιον*). This word, properly meaning the skull of an ox, has been applied to a representation of the skull, as well as of the entire head, frequently used in decoration. Some writers have so applied it to the head of any horned beast employed on pedestals and altars, as at Cora, Halicarnassus, and Aphrodisias; and in friezes, either in the metopes, as at Athens (STUART, *Antiquities*, i, 1), or combined with festoons, as in the temple to Vesta at Tivoli, the arch of the Sergii at Pola, the temple to Fortuna Virilis at Rome, and on the tomb of Cæcilia Metella near that city. STUART, *Antiq.*, supp. volume, chapter 6, pl. 2, shows a triglyph from the island of Delos, on which a bucranium is sculptured. Sir W. CHAMBERS, *Essay*, 1st edit., p. 20, in speaking of the Doric order, observes, "the metope is enriched with a bull's skull adorned with a garland of beads, in imitation of those on the temple of

Jupiter Tonans at the foot of the Capitol. In some antique fragments, and in a great number of modern buildings, metopes are alternately enriched with these ox skulls and pateras." Another example has been mentioned as existing at the theatre of Marcellus; but the precedent for the modern employment of this ornament is not known. *ÆGICRANIUM*. *BULL'S HEAD*.

BUDA in Hungary, see *OFFEN*.

BUDDHA ('Temples to). The present or fourth Buddha, called Sakya Muni or Sinka, born in India B.C. 623, gave to Buddhism its peculiar doctrines and mode of worship; and they were adopted by Asoka, the most powerful monarch of India at that period, instead of the Brahminical faith of his predecessors. The architectural history of India, which commences with his accession to sovereignty in 250 B.C., exhibits a series of Buddhist rock cut or cave temples, of which the most beautiful, or at least the best known, are those at Karli (first century of the Christian era); Ajunta cave, No. 10 (perhaps of the same date); Ajunta cave, No. 9 (second or third century); Ajunta cave, No. 19 (fifth century); Viswakarma, at Ellora (seventh or eighth century); Kannari (ninth or tenth century); and Ajunta cave, No. 26 (of about the same date), to which may be added, as curiosities, the Lomas Rishi and the Khoodha caves in the Barabar hills near Gaya in Bahar, belonging to the second century B.C. There are Buddhist temples in the various groups of the Western Ghats, but none of them have yet been sufficiently investigated.

FERGUSON, *Handbook*, 8vo., London, 1855, gives an illustrated history of the temple (*CHAITYA*), monastery (*VIHARA*), and monuments (*DAGOBA*, *KIUM*, *KOSTHAKA*, *LATH*, *PANDU-KOLI*, *RATH*, *STHUPA*, *STHAMB*, *TOPE*) belonging to Buddhism; and observes that the Buddhist temples in India are only about twenty or thirty in number; while perhaps nine hundred monasteries may be found, chiefly divided into about forty or fifty groups around built Buddhist shrines as is generally the case in Afghanistan, and consequently not requiring any *rock cut* place of worship. Indeed in the more modern caves at Ajunta and elsewhere, the monastery contained a chapel or place of worship in some measure independent of the temple to which it was originally subordinate: and this appears to be the case in Burmah, where as in Java, Ceylon, China, and Thibet, Buddhism has continued after the Mahometan conquest of India, when it had ceased to be a prevalent religion in the land of its birth. The principal Buddhist building in Ceylon, which may therefore be considered as a temple, is at *POLLANARUA*. The Indian temples are illustrated in FERGUSON, *Rock-cut Temples*, fol., London, 1845, and by KITTOE, in the *Journal of the Asiatic Society at Bombay*, 1847, pp. 275, 334, 408, 954.

BUDDISSIN, or *BUDISHYN*, in Saxony, see *BAUTZEN*.

BUDGET. A small wallet or pocket to contain nails, used by plasterers, bricklayers, and slaters. 2.

BUDWEIS or *CZESKY-BUDIEGOWICE*. The capital of the circle of the same name in Bohemia. It is a very small but well built city, containing eight churches (one made cathedral in 1783), courts of justice, a *rath haus*, an equally fine arsenal, an extensive custom house, a theatre, a monastery, and three large schools. 26. 50.

BUENOS AYRES in South America, see *NUESTRA SENORA* or *STA. TINITA* DE *BUENOS AYRES*.

BUERE (CLAIRS or NICOLAUS VON), was *dombaumeister* or cathedral architect at Cologne in the years 1433-52. 92.

BUFFET, sometimes improperly written *BEAUFET*. A table with long narrow shelves over it. A similar dresser, which was found at Pompeii, was formed of a sort of console table standing on one leg, and having two shelves over it, attached to the wall. The buffet, as a subject of legislation and etiquette in the fourteenth century, is described in the *Historical Life of Joanna, Queen of Naples*, 18mo., London, 1824, p. 110-18. In France and Italy, such a dresser or sideboard (*lit. credenza*) was placed, as is still the case in the palaces of some cardinals, in the great saloon, and was inclosed by a balu-

trade; and in some French examples the buffet was a *cabinet* divided by a perforated screen from the saloon. In later times doors were added to this "cup-board", perhaps in imitation of the foreign mode of closing an organ case (*buffet d'orgue*), when the instrument was not in use. The word buffet is now given not only to a side table for refreshments, but to the refreshment rooms at the stations on foreign railways, and to a room next the dining room in which the courses of the repast are arranged previously to the service of the table. 2. 13. 25.

BUGA. A name given in Spain to the black marble, also known as *Namur marble*, common in many parts of Europe. 13.

BUHL WORK, formerly known as *Boule work*, from the name of André Charles Boule, architect, painter, carver and engraver of Paris (1642-1732), who was the inventor of this mode of decoration chiefly employed for furniture. It consists of one or more metals inlaid upon a ground of tortoise-shell, alone or with wood; or of these last-named materials inlaid upon grounds of metal. The manufacture is described at length in the *Architect Journal*, i, 347.

BUILDER. A person who carries on the various trades requisite in the erection of a building. This meaning is so recent as not to appear in English dictionaries published before the year 1819; and even then the definition given by NICHOLSON is "a person who contracts to build or rear up edifices," whereas a builder need not be a contractor. The system of combining all the trades does not seem to have existed much before the commencement of the present century, and has been perfectly carried out only by a few capitalists, as is evinced by the anxiety displayed at present to guard against the evils of sub-letting.

The previous term for a speculative builder appears to have been "undertaker", as will be seen s. v. *CONTRACTOR*: and "builder" was understood to mean either the *BUILDING OWNER* or the master workman of each principal trade employed: by the late Metropolitan Buildings Act, the term builder included "the master-builder or other person employed to execute any work, or if there be no master-builder or other person so employed, then the owner of the building or other person for whom or by whose order such work is to be done"; but this was repealed by the Act 18 and 19 Vict. c. 122, which provides that the term shall apply to and include the master builder or other person employed to execute or who actually executes any work upon any building. The epoch of the "division of labour" has seen all the trades connected, however remotely, with a building combined in single hands, to the loss of all concerned except the capitalist: the present method destroys skill, etc. *Third and Fourth Reports of the Commissioners of Military Inquiry*, fol., London, 1806, pp. 139-41, 266, 295, 299, 314, 337-9, 375, 393, 414.

BUILDING. This word signifies the act of putting together the materials of any structure; it also expresses the structure itself which, if it has not been carried further than the erection of the essential parts of construction, is called a *carcass*.

BUILDING, see the *Detached Essays*, FULLER *On Magnificent Building*; and GERBIER, *The Three Chief Principles of Magnificent Building*.

BUILDING ASSOCIATIONS, see *WORKSHOP*.

BUILDING LAWS. The relation of one *BUILDING OWNER* to another, to the state, and to individuals, as it existed under the Romans is considered at some length under the article *Servitudes* in SMITH, *Dictionary of Greek and Roman Antiquities*, 8vo., London, 1849; the text being taken in great part from DIRKSEN, *Ueber die gesetzlichen Beschränkungen des Eigenthums, etc.*, *Zeitschrift*, ii, which would form the subject of an entire essay if combined with another work by the same author; this, entitled *Das Polizei-gesetz des Kaisers Zeno*, in the *Transactions of the Royal Academy of Sciences in Vienna*, 1844, p. 81, has been given by HAMILTON, in the *Museum of Classical Antiquities*, 8vo., London, 1851, i, 305, who has added, p. 341, a collection of some of the building laws of the Roman empire. The notes to the three articles

supply a list of works of reference. The history of building laws in France since the ordonnance of Charles IX at Orleans in 1560, art. 96, is to be found in BULLET, *Architecture Pratique . . . avec une explication des articles de la Coutume, qui regardent les bâtimens*, 8vo., Paris, 1691; or more at length in DESGODET, *Lois des bâtimens suivant la Coutume de Paris*, with the *Comments* of GOUPEY, 1748; the notes in other editions, especially that of 1768; of MOREL, 1826, of JAY, 1825, of SÉGUIN, 1788, and of LEPAGE, 1840; the latter includes the code Napoleon. FAVIER, *Examen des Conditions du mode d'adjudication des Travaux Publics*, 8vo., Paris, 1824; FRENY, *Code des Architectes et Entrepreneurs des Constructions*, etc., 8vo., Paris, 1837; and MIGNARD, *Guides des Constructeurs*, 8vo., Paris, 1847, ii, 252-364, may also be consulted. A note upon recent Prussian building regulations is given in the *BUILDER Journal*, xi, 555. The seventh and last general division of STAUNTON, *Ta tsing leu lee*, 4to., London, 1810, contains the Chinese laws relative to public works, buildings, and highways; see *Detached Essay*, CHINESE ARCHITECTURE. In Scotland the servitudes of the Roman period still form subjects of legal investigation, while in England the questions of light and air, fences, drains, etc., are far from being so completely embodied as by LEPAGE and by MIGNARD, above cited.

Several statutes have been enacted as to roads and sewers, which have come into a connected shape; and several detached laws have been made, as those of 6 Henry VIII, c. 5, and 7 H. VIII, c. 1, against the destruction of towns; perhaps the most curious are those of 26 Henry VIII, c. 8, 9; 27 H. VIII, c. 1; 32 H. VIII, c. 18, 19; and 33 H. VIII, c. 36, for the repairing and rebuilding of a great number of the chief towns in England. HUDSON TURNER, *Some Account of Domestic Architecture*, 8vo., Oxford, 1851, p. 275, gives the London Assize of 1189, and p. 281, that of 1212 (see also *BUILDER Journal*, xii, 366), which may be considered as the precursors of the present Building Act. The earliest statute relative to the erection of buildings in the metropolis is said to be that of 35 Elizabeth, c. 6; but the first important enactment is that of 18 and 19 Charles II, c. 8, generally called 19 C. II, c. 3, which was enlarged, as regards the city itself, by an Order in Council 8 May, 1667. Enlargements, amendments, alterations and explanations will be found in the Acts 22 Charles II, c. 11; 6 Anne, c. 31; 7 Anne, c. 17; 11 G. I, c. 28; 33 George II, c. 30; 4 George III, c. 14; 6 G. III, c. 27; 6 G. III, c. 37; 12 G. III, c. 73; 14 G. III, c. 78, commonly called the "Black Act of 1774"; 50 G. III, c. 75; 4 and 5 William IV, c. 35; 3 and 4 Victoria, c. 85; 7 and 8 Vict. c. 84, with the variations by Commissioners of Public Works; and the present Metropolitan Buildings Act, 18 and 19 Victoria, c. 122, which present a curious history of "progress". The Liverpool Health, etc., Act, 5 Victoria, sess. ii, was framed at the instance of the Fire Assurance Offices by Mr. W. Tite of London and Mr. Stewart of Liverpool. *Report on Buildings, Regulations and Improvement of Boroughs*, fol., London, 1842. CHAMBERS and TATTERSALL, *The Laws Relating to Buildings*, 1845. ACCESSION, DILAPIDATIONS, FIXTURES, LIGHT AND AIR, SERVITUDE, etc.

BUILDING MATERIALS, see ATMOSPHERIC INFLUENCE, BRICK, STONE, etc. WILSON, *Chemistry of Building Materials*, in the *Transactions of the Architectural Institute of Scotland*, 8vo., Edinburgh, 1855.

BUILDING OWNER. The term adopted in the Metropolitan Building Acts, 7 and 8 Vict. c. 84, s. 20, and 18 and 19 Vict. c. 122, s. 82, for the person at whose order and expense works connected with building are to be done. Great confusion has arisen in the accounts given of ancient edifices, as the terms *BUILDER*, *edificator*, *erector*, *fabricator*, were indiscriminately applied in the Latin writings of all ages, as well as at the present time in English, to the owner who is called the "builder and levier" in 19 Chas. II, c. 3, and to the master workman of the principal trade employed, called "head builder or workman" in 6 Anne, c. 31, as well as to the

designer, who is more generally known in records as *magister operum* (Fr. *maître de l'œuvre*, Ger. *baumeister*), or master of the works; for the French term *bâtitseur* is never applied to an architect or to a master tradesman, but only to the owner.

BUILDING SOCIETY, BENEFIT. An association formed under Acts 6 and 7 William IV, c. 32, and 9 and 10 Victoria, c. 27, for the purpose of enabling individuals to purchase houses by annual payments for a certain number of years, instead of by a sum of ready money; the society completing the purchase and taking a mortgage of the property purchased. In some societies the purchase-money is simply repaid; in others a certain rate of interest is charged: in the former the contributor simply has the advantage of purchasing; in the latter he receives interest on his subscription, but as a set-off pays more for the loan. Such societies have exercised a beneficial influence on the poorer classes of society, by offering the means of investment hitherto open only to the comparatively wealthy. SCRATCHLEY, *Treatise*, etc., 8vo., 2nd edit. London, 1851; JAMES, *General Guide*, etc., 12mo., London, 1849. H. B. C.

BUILT BEAM. The name given to a beam composed of two or more pieces of timber, laid side by side, and fastened by straps or bolts: sometimes iron is put between the timbers.

BUKAREST. The capital of the province of Wallachia in European Turkey. The Turkish dwellings with their projecting cornices and bay windows contrast strongly with some handsome modern houses and the public buildings, of which the chief are the hospodar's palace; the fire-tower, 60 ft. high, in the centre of the town; about sixty places of worship, each having from two to six towers (*ILLUSTRATED LONDON NEWS Journal*, xxiii, 445); twenty monastic institutions; two colleges; several hospitals; thirty khans; and a bazar. The very remarkable church of S. George, with its narthex on twisted columns carrying an arcade and a canopy over the centre, is given in DEMIDOFF, *Voyage*, fol., Paris, 1840, pl. 14, who also shows, pl. 16, a Greek church, apparently once a mosque.

BULAN or BULANT (JEAN), see BULLAN (JEAN).

BULBOUS. A term applied to pear-shaped spires of the sixteenth and two following centuries, and to domes exhibiting more than a semicircle in section, as in Mahomedan examples. In Flemish and German cities, in Italy and in the Peninsula, the covering of the lantern or tower often appears as if one or more of the bulbs, which are sometimes polygonal instead of spherical, had been fixed upon a more or less taper spire. *Illustrations*, pl. xiii, xiv, s. v. Campanile.

BULENTERIA, a frequent mistake for BOULEUTERION.

BULET, see BULLET (PIERRE).

BULFINCH or BULLFINCH (CHARLES) was appointed architect to the capitol at Washington on the resignation of La Trobe in 1818; he erected the rotunda, improved the design of the east front, and finished the building of that edifice; DUNLAP, *History*, etc., 8vo., New York, 1834, i, 336; ii, 467.

BULGE (Fr. *bouffer*). The word used to express a deviation, resulting from overloading or bad construction, from the perpendicular in the middle of the height or length of a wall; if the facework has separated from the body of the wall and bulges, it is said to *buckle*.

BULK or BALK, a great beam.


BULK. A stall before a shop; BAILEY, *Dict.*, fol., London, 1736. It was a STALL BOARD of substantial structure projecting from the general line of houses into the street, and protected by a penthouse; thus forming the better kind of shop in use about two centuries ago; the inferior shops having only movable stalls formed of boards upon trestles.

BULKER. A Lincolnshire term for a small beam or a rafter, from BALK or BULK.

BULKHEAD. The name, derived from BULK in the second explanation above given, for the projection into a room of the upper part or headway of an enclosed staircase.

BULLAN, BULAN, BULANT, or BULLANT (JEAN), born in 1520, appears to have returned from Italy in 1544, and to have

commenced in the following year, with Jean Goujon, the châteaueau at Ecouen, for the constable Anne de Montmorency. In 1557 he was appointed *contrôleur des bâtiments*. His plan for the Tuileries was accepted by the queen Catherine de Medicis, who placed it for execution in the hands of Philibert de Lorme, who is said to have designed, conjointly with Bullant in 1564, the central building flanked by two wings and their pavilions (which pavilions are said to have been executed by Bullant), looking towards the garden of the palace, BLONDEL, *Architecture Française*, fol., Paris, 1752, iv, p. 71, pl. 24. In 1567 he designed the tomb of Anne de Montmorency in the church of the Celestines, now destroyed; in 1573 he converted the hôtel d'Albret into a palace for the queen, thence called the hôtel de la Reine, and after 1604 the hôtel de Soissons; the site was occupied by the halle aux blés, etc., in 1763-67, and only the astrological column remains. For the same queen, upon changing Chaumont for Chenonceau, he altered the latter on a plan (given in DU CERCEAU) which was not fully carried out when the works were stopped by the queen's death in 1589; for Henry III he finished the tomb of the Valois at S. Denis, commenced in 1560 by de Lorme and Primaticcio, and continued by Jacques A. du Cerceau; for Henry IV, in 1596, he began the five bays of the gallery at the Louvre in continuation of the Pavillon of Flora designed by Dupérac; they were finished by Jean B. du Cerceau. Bullant retired from practice on account of his advanced age to Ecouen, supposed to have been his native village, and died there in 1598. He published *Reigle generale d'Architecture*, fol., Ecouen, 1563 and 1568, edited by De Brosse in 1619; and a *Traité de Geometrie* in 1567. The châteaueau of Ecouen, illustrated by BALTARD, *Paris et ses Monumens*, fol., Paris, 1805; and the plan of the hôtel des Ligneris, afterwards Argouges, afterwards Carnavalet, are works ascribed to Bullant; the only part now remaining of the latter one belonging to his time is the doorway, given in the *Arch. Fran.*, ii, 149. The story by REVOL, in *Souvenirs*, fol., Paris, 1836, p. 50, appears a fiction. 47.

BULLEN NAIL. A nail with a short square shank, and a round convex head, principally used for the hangings of rooms, cloth doors, etc. Such nails are made of five kinds, common white, white burnished, common lacquered, lacquered burnished, and black.  2.

BULLET WOOD. A valuable wood obtained from a very lofty tree having a white sap, and indigenous to the Virgin Isles in the West Indies; it is close and hard in texture, and of a greenish hazel colour; it resembles the greenheart, and is used by the natives for ship building as well as for building purposes. A specimen of the *booley* or *bully* tree of South America exhibited an excellent hard wood, very dense and of a plain deep purple red. Another species from Berbice is of a hazel-brown colour of an even tint. *MIMUSOPS*. 23. 71.

BULLET or **BULET** (PIERRE), was born about 1639. FRANÇOIS BLONDEL, *Cours*, fol., Paris, 1698, i, 603-605, mentions that Bullet had, under his direction, made the plan of Paris and executed most of the leading works then carried out by the municipal authorities. He became a member of the Academy of Architecture at Paris in 1685, and architect to the king; he designed the entrance with an Ionic order to the *pompe* of the bridge of Notre Dame; in 1674 the *porte* S. Martin, given by BLONDEL, *Arch. Fran.*, fol., Paris, 1752, iii, 14; in 1675 the *quai* Pelletier, given in PATTE, *Mémoires*, 4to., Paris, 1769, pl. 7; the fountain of the *place* S. Michel; two chapels in the transept of the church of S. Germain des Prés; the hôtel de Valloray, *rue de Seine*, given in the *Arch. Fran.*, ii, 93; the hôtel de Tallard, *rue des Enfants Rouges*, for Amelot de Chaillou; in 1683 the church of the Noviciate of the Dominicans (the façade was added in 1768); the hôtel de Crozat, since called de Tunis, and the hôtel d'Evreux, since called de Thiers, in the *place Vendôme*, both are given in the *Arch. Fran.*, iii, 106-108, the first with the changes made in 1724; both were again altered in 1747; in

1712 the houses along the frontage occupied by the monastery of S. Martin, in the street of the same name; the châteaueau d'Issy, for the dowager princess de Conti, BLONDEL, *Cours*, 8vo., Paris, 1771, ii, 182, pl. 83-84; iii, 97, pl. 14; and v, 91, pl. 37-38; and the portal of the archiepiscopal palace at Bourges, in the same work, iii, 82, pl. 11. 34.

Bullet published a *Traité de l'usage du Pantometre*, 8vo., Paris, 1675, being the description of his graduated bevel; a *Traité du Nivellement*, 8vo., Paris, 1688, with a description of his levelling instrument; and *L'Architecture pratique, qui comprend le détail du toisé et du devis . . . avec une explication de la coutume sur le titre des servitudes et rapports qui concernent les bâtimens, etc.*, 8vo., Paris, 1691; of this thirteen various editions are mentioned by QUÉRARD; it contains commentaries on the BUILDING LAWS of Paris since 1673. *His plans et profil du palais épiscopal* at Bourges were engraved in three plates by Lucas; and a *Livre nouveau de chemintes*, in eight plates by Nolin. BLONDEL, *Cours*, 8vo., Paris, 1771, iii, pl. 86, also gives the two orders employed in the hôtel de Thiers, vi, 475; ascribes to him the hôtel Pelletier des Forts; and ii, 323, iii, 302, 368, the conventual church of the Jacobins of the Faubourg S. Germain in the *rue S. Dominique* (unfinished in 1752), citing in the *Arch. Fran.*, ii, 93, with some distrust, LAMBERT, *Histoire Littéraire du règne de Louis XIV*, 4to., Paris, 1751, iii, 137. Bullet died in 1716, aged 77. 45.

BULLET, SEIGNEUR DE CHAMBLIN (JEAN BAPTISTE), commonly called CHAMBLIN, was the son of the subject of the preceding article; he designed the châteaueau de Champ; and is entered as a member of the Academy of Architecture at Paris under the date of 1699. 45.

BULLOCK SHED, see **CATTLE SHED**.

BULL'S EYE (Fr. *œil de bœuf*). A circular aperture for the admission of light or air into a room.

BULL'S HEAD. The term is applied not only to a BUCRANIUM, but to the forepart of a bull employed in various ways in architecture, as in friezes at Baalbec, CASSAS, *Voyage Pittoresque de la Syrie*, fol., Paris, 1798, ii, pl. 16-17: as in the metopes of the amphitheatre at Arles, LABORDE, *Monumens*, fol., Paris, 1816, pl. 79-80; and as in a capital among the remains in the island of Delos, given by STUART and REVETT, *Antiquities*, fol., London, 1816, iv, c. 6, pl. 1; and by REVETT, *Expedition Scientifique de Morée*, fol., Paris, 1836, iii, 7 and 8; and others are given by TEXIER, *Description de l'Arménie*, fol., Paris, 1842, pl. 123 and 125; and perhaps pl. 104 and 138. It has been stated that bulls' heads were symbols applied to edifices dedicated to the emperor Augustus (and his successors?); with regard to the antique buildings at Nîmes (as in the amphitheatre given pl. 13 by CLERISSEAU, *Antiquités*, fol., Paris, 1804), by MÉRIMÉE, and with regard to the amphitheatre at Arles by ESTRANGIN, *Etudes Arch.*, etc., 8vo., Aix, 1838.

BULL'S NOSE. A term applied to an obtuse angle in a wall; and to corners when the external angle is rounded off: a bull-nose step is a sort of false CURTAIL.

BULLY TREE, Black bully, Naseberry bullet tree, Sapodilla, or ACHRAS Sapota. A very lofty tree of Jamaica and Guiana, producing a valuable hard wood of a greenish colour. ARCHER, *Economic Botany*, 12mo., London, 1854. The bastard bully trees of Jamaica are species of BUMELIA.

BUMELIA SALICIFOLIA, bastard bully tree, a wood of the West Indies, Jamaica, and British Guiana (called *touranero*), from the river Demerara. It is close, even grained, hard, and heavy, and used for framing, spokes, etc. Timber of ten inches in diameter is obtained from a tree supposed to be about fifty years old; and timber has been procured 25 inches square and from 40 to 50 feet long. *B. nigra* (*cocuyo*) is a very dense wood of Cuba. *MIMUSOPS*. 71.

BUND, **BAND**, **BEND** or **BENDT**. The oriental term for a reservoir, and by custom for the dyke or wall which forms the dam. There are four such near Constantinople, besides three smaller ones, and many Asiatic towns have such means of

penning up water. The dams have often been made structures of great architectural magnificence in India, by covering them with flights of steps, and erecting, in the breaks between these flights, temples, and pavilions or kiosks, interspersed with fountains and statues. Those at Oodeypore, A.D. 1653-80, and 1680-99, each about 1000 feet long are given by FERGUSON, *Pict. Illust.*, fol., London, 1848, pl. 12-13, and that at Poonah, in the *ILLUSTRATED LONDON NEWS*, xviii, 172.

BUNDLE PILLAR. A pier consisting of small columns attached to a central larger one.

BUNHO. A light brown wood of Penang, forming a large tree, and occasionally used for building. 71.

BUONACCOLTO (BUONO), see BUONO.

BUONAMICI (GIAN FRANCESCO), of Rimini, studied at Rome, and rebuilt 1734-45 the cathedral at Ravenna, which he published under the title *Metropolitana di Ravenna colli disegni dell' antica basilica, del Museo Arcivescovile, e della Rotonda fuori delle mura della città*, fol., Bologna, 1748. He also published his *Fabbriche fatte sul porto di Pesaro*, fol., Bologna, 1754, containing the quay, the lighthouse, offices, sheds, storehouses, six rows of houses, market and fountain.

BUONARROTI SIMONI (MICHEL AGNOLO), born 6 March, 1474, was a son of Lodovico di Lionardo Buonarroti of the family of the counts of Canossa, and podestà in that year of Chiusi-and-Caprese in the diocese of Arezzo. He was apprenticed for three years to a painter at Florence, 1 April, 1488, and began to study sculpture. In 1503 he was invited to Rome to commence the tomb for pope Julius II; under Leo X (1513-22) he executed the loggie at the corner of the palazzo de' Medici at Florence; see VASARI, in v. *Giovanni da Udine*. He commenced in the same city, for pope Clement VII (1523-34), the square chapel and cupola (with the decorations executed by Silvio Cosini) of the sacristy, given by RUGGIERI, *Scelta*, fol., Florence, 1755, ii, pl. 1-14, to the church of S. Lorenzo; VASARI's criticism is worth attention: and for the same pontiff he designed the decoration and furniture (*Illustrations*, Furniture, pl. 34) of the library of S. Lorenzo, illustrated by Rossi, *La Libreria Mediceo-Laurenziana*, fol., Florence, 1739; and by RUGGIERI, i, pl. 1-13; see Paper read by Mr. T. L. Donaldson at the Royal Institute of British Architects, 14 Nov. 1853, and the *BUILDER*, *Journal*, xi, 725; and a part of the façade of the church, commenced 1513-22, but the works were suspended at the accession of Paul III (1534-50), who summoned him to Rome, where he completed, in the church of S. Pietro in Vincoli, the tomb of Julius II (MILIZIA, s. v. *Fuga*, says that Buonarroti here introduced the use of TERMINALS in architecture); at the same time he began the repairs to the foundations of the bridge of Sta. Maria; and was appointed in 1546 successor to Antonio da San Gallo, as architect to S. Peter's. He partly filled up the four principal piers; formed the first cornice over the arches, and commenced the two great recesses of the transept, but reduced the eight niches or tabernacles on the side towards the Campo Santo to three, with a vaulting of travertine stone, and a range of windows; and designed the internal and external ashlar architectural decoration of a Corinthian order, employed by Maderno; added the attic and two lateral cupolas (these last were executed by Barozzi, PISTOLESI, *Il Vaticano*, fol., Rom 1825, ii, e, 264), and gave the model for the tambour and dome, which was followed in all parts except the lantern; BUONARROTI, *Libro d'Architettura di S. Pietro in Vaticano*, fol., Rome, 1620. He designed and partly executed the piazza of the capitol, comprising the double flight of steps to the great hall, given by FALDA, *Fontane*, i, 14; a façade on the south side to the palazzo de' Conservatori; a similar façade was erected on the north side for the palazzo del Museo, after his death; and on the west a flight of steps of very easy ascent, the whole surrounded by its balustrade; these works, given in ROSSINI, *Monumenti*, pl. 31, 39, were executed by T. de' Cavalieri, they are injured by the central windows introduced by Giacomo del Duca, who was succeeded by Giacomo della

Porta, Girolamo Rainaldi, and others; FERRERIO, *Palazzi*, pl. 51-52. At the same period Michel Agnolo executed the celebrated cornice to the palazzo Farnese, and on the death of Sangallo became architect to that building, where he constructed the great window over the principal entrance, the two ranges of columns over those previously erected in the great court, enlarged the great hall (this is contradicted by LETAROUILLY, *Rome Moderne*, 4to., Paris, 1840, p. 316), and made arrangements for the vestibule, which he vaulted after a new manner, in the form of a half oval; the works were superintended by Barozzi, who succeeded him according to LETAROUILLY, 262-275, 287-297, 302, and 312. Pope Julius III (1550-55) would not suffer anything to be done without Michel Agnolo's advice either at the villa Giulia or the Belvedere. The flight of steps now used was at that time constructed at the last mentioned palace, in place of the semicircular staircase designed by Bramante; and LETAROUILLY, 454, admits that he designed the central window on the first floor of the villa Papa Giulia. Under pope Pius IV (1560-66) he supplied many designs, among which were the bronze monument of Giovanni Giacomo de' Medici, marquis of Marignano (who died 1555), executed by Lione Lioni of Arezzo, in the cathedral at Milan; the Porta del Popolo, executed under him by Barozzi in 1561, and the Porta Pia, which was left unfinished at his death; the new Carthusian church, dei Termini, or of Sta. Maria degli Angeli in the baths of Diocletian, which was spoilt by Orlandi, but altered in 1749 (MILIZIA, in v. *Vanvitelli*), and its cloister, ROSSINI, pl. 29, 46; and the church of S. Giovanni of the Florentines in the Strada Giulia, which was commenced but soon suspended; it was finished by Giacomo della Porta, except the front, which is by Galilei (MILIZIA), given in ROSSI, *Chiese*, pl. 48-49. He died 17 Feb. 1563, according to VASARI, and was buried in the church of the S. Apostoli at Rome, but the body was solemnly interred in that of Sta. Croce at Florence.

Besides the above works, which are mentioned by VASARI, local histories ascribe to Michel Agnolo the cathedral at Padua, which however was not finished until 1754; the villa Cambroso on the colle d'Albaro, near Genoa, built 1557 by Alessio, from his design; the lower windows of the palazzo Riccardi by Michelozzi at Florence, given by RUGGIERI, i, 16; doorways in Florence in the churches of Sta. Apollonia, Sta. Maria della Neve, the Gesù Pellegrino or Congrega Maggiore, given by RUGGIERI, i, pl. 17-20, and S. Giuseppe dei Paolotti; the twelve altars in the transepts of the cathedral at Pisa; at which place the palazzo Lanfreducci (the work of Cosmo Pagliani), and the palazzo Lanfranchi, are said to have been by him; the palazzo Guerin and the ciborium in the cathedral at Forlì; the designs for the painted glass in the chapel of S. Antonio di Padua in the church of S. Petronio at Bologna; the ciborium in the church of S. Vitale at Ravenna, and the well in the court of the new hospital there, with another in the court of the convent of S. Pietro in Vincoli at Rome, ROSSINI, pl. 51; in the last-named city the doorway of the palazzo Colonna; the enlargement (LETAROUILLY, 212) of the collegio della Sapienza, commenced under Leo X, and finished in 1576 by Giacomo della Porta; the rostral column, in imitation of that of Duilius on medals, in the palazzo dei Conservatori; the garden façade of the villa Medici; and the portico of the church of Sta. Maria della Navicella or in Domnica; and part of the fortifications; as well as the fort at Civita Vecchia, 1512, and the defences of the city of Florence in 1529. 28.

The usual editions of BAROZZI, *Li cinque Regole*, contain an appendix of designs attributed to Buonarroti for gateways, such as those called Grimani, Sforza, Sermoneta, etc. ROSSI, *Disegni di Vari Altari*, pl. 6, 7, gives the Strozzi chapel in the church of S. Andrea della Valle, and pl. 13, 14, the Sforza chapel in the church of Sta. Maria Maggiore, both at Rome: LALANDE, *Voyage en Italie*, 12mo., Venice, 1769, viii, 487, adds the palazzo Carega in the strada Nuova at Genoa, and the palazzo Pallavicino at Zerbino; LETAROUILLY, *Rome Moderne*, 4to., Paris,

1840, 187, denies the palazzo Linotti, formerly Silvestri, to have been by him. *Esequie del dicino Michelangelo Buonarroti* celebrati 28 Giugno 1564 (but VASARI says 14 July 1563), 4to., Firenze, 1564; VARCHIO, *Orazione . . . nell' Esequie*, 4to., Florence, 1564; TARSIA, *Orazione . . . nell' Esequie*, 4to., Florence, 1564; CONDINI, *Vita*, fol., Florence, 1717, and later editions; GORI, *Vita*, fol., Florence, 1746; VIGNALI, *Vita*, 4to., Florence, 1753; VASARI, *Vita*, 4to., Rome, 1760; HAUCHECORNE, *Vie*, 12mo., Paris, 1783; PIACENZA, *Vita*, 4to., Turin, 1813; DUPPA, *Life*, 4to., London, 1806; REUMONT, *Beitrag zum Leben*, 8vo., Stuttgart, 1834; DE QUINCY, *Histoire de la Vie*, 8vo., Paris, 1835; NAGLER, *M. A. Buonarroti*, 8vo., Munich, 1836; GIUDICI, *Vita*, 8vo., Palermo, 1844.

BUONO. The following works have been attributed to architects of this name.

1. The church of S. Michele in Borgo at Pisa in 1018, WEBB, *Sketches*, 8vo., London, 1848.

2. The enlargement of the church of Sta. Maria Maggiore at Florence about 1150, WEBB and VASARI; but inscriptions are given in a note p. 29 of VASARI, *Lives*, 8vo., London, 1850, showing that Deotisalvi was engaged thereon, and that the building was commenced in 1153.

3. Palazzi and churches at Ravenna about 1152, CICOGNARA, *Storia*, fol., Venice, 1818, i, 324, and VASARI, who also adds that this architect was invited to Venice, where he founded and finished in 1154 the campanile in the piazza di S. Marco (but CICOGNARA, *Fabbriche*, fol., Venice, 1838, i, 49, says that it was built on the foundations of 888-979, up to the belfry, 1148-55, and that the old belfry was erected 1173-78); to Naples, where he founded the castel del' Uovo and the castel Capuano, begun 1154 (which were finished by Fuccio, MILIZIA); and to Arezzo, where he constructed the palazzo de' Signori (which, however, was not founded until 1232, VASARI, p. 47).

4. The churches of S. Andrea and of S. Giovanni at Pistoja, VASARI, from inscriptions thereon dated 1166, "Gruamons magister bonus", given by CICOGNARA, *Storia*, i, 323, and show a mistake on the part of those who see therein the name of Buono, instead of a laudatory adjective.

5. At Arezzo the palazzo de' Signori in 1232, destroyed almost entirely for the new fortifications in 1533, as well as the erection in 1263 of the church of S. Pietro in Pistoja, or at least its principal doorway; the name of Buono is mentioned in an inscription dated 1265 on the chapel of S. Giacomo, and in 1266 in the church of Sta. Maria Nuova, and in another dated 1270 (WEBB) on the west front of the church of S. Salvatore in that city, which are given by CIAMPI, *Notizie inedite della Sagrestia Pistoiese*, 4to., Florence, 1810, p. 38, who states that his name was Buono di Bonaccolto, or Bonaccursus of Florence.

BUONO (?) DELLA MADONNA DELL' ORTO (BARTOLOMMEO) is mentioned as the architect to whom the erection, or at least the revision and completion, about 1439, of the porta della Carta in the ducal palace at Venice is attributed on account of the inscription, "Opus Bartholomei", by CICOGNARA, *Fabbriche*, fol., Venice, 1838, i, 62-85, who also, i, 119, ascribes to him the palazzo Foscari a S. Pantaleone. MOSCHINI, *Guida*, 12mo., Venice, 1815, i, 401, records the interview between this artist and Bartolommeo della Cisterna in 1448.

BUONO (BARTOLOMMEO), commonly called MASTRO BUONO of Bergamo, is also claimed as a native of Venice, where he superintended in 1493 the painters in the palazzo ducale, and attended to the works at the lazaretti; presided in 1500 over the execution by Guglielmo Bergamasco of the works designed by Pietro Lombardo to the procuratori vecchie; succeeded in 1505 to B. Gonella as proto dei procuratori for the church of S. Marco; and erected 1510-16 the new bell-chamber, attic, and spire (*guglia*) to the campanile of S. Marco. To him also are attributed the interior of the tribune or capella maggiore of the church of S. Rocco, erected in 1495, with the two lateral chapels; and the design and part of the execution of the scuola di S. Rocco, completed by Sante Lombardo and

Antonio Scarpagnino (and restored by Scalfurati, MILIZIA). He died in 1529. CICOGNARA, *Storia*, fol., Venice, 1818, ii, 171, and *Fabbriche*, fol., Venice, 1838, i, 62, 85, 87; SORAVIA, *Chiese*, 8vo., Venice, 1822, ii, 302, etc.

BUONSIGNORE, sometimes written BONSIGNORE (FERDINANDO), architect to the king of Sardinia, and professor of architecture at Turin, died in March 1844, designed the church dedicated to the "Gran Madre di Iddio" in that city, which is given in the BAUZEITUNG Journal for 1837.

14. BUONTALENTI or BONTALENTI (BERNARDO TIVIANTE), called DALLE GIRANDOLE from his acquirements in theatrical and other machinery, was born at Florence in 1535-6, and appointed in 1550 by the grand duke Cosmo teacher of drawing to his son Francesco, with whom he travelled to Spain in 1563, and for whom, when vice-duke, he built in 1569 the country residence called Pratolino, which is now destroyed, details are given in RUGGIERI, *Scelta*, fol., Florence, 1755, i, pl. 52-7; in 1570 the casino di S. Marco; in 1576 he designed the preparations for the baptism of his patron's son, thenceforward having the direction of all public exhibitions, especially at theatres and funerals; and was also made superintendent of military and civil buildings. His works form a long but undated list; the leading ones for this prince were the stanze or apartment over the zecca or mint; the porta delle suppliche under the vault of the ufizi, and a rusticated doorway to the palazzo Vecchio, RUGGIERI, i, 35, and ii, 41; the Tuscan order of the fronts of the palazzo vecchio towards the east, and towards S. Piero Scheraggio; the galleries over the ufizi nuove, and the circular hall called the tribuna; a corridor commenced by him in 1564, and extending half a mile in length from them to the palazzo Pitti; the continuation upon the designs by Ammannato of the state apartments in that palace; a grotto in the Boboli gardens; all at Florence: the villas of Marignolla, afterwards Capponi; of Magia, afterwards Attavanti, and more recently Amati; and of Artimino (1594) or Ferdinanda; besides the restoration of those called Pietraia and Castello, in the neighbourhood of the city: the loggia de' Banchi (1605); the ducal palace; and the façade of the church de' Cavalieri at Pisa: and the palazzo at Siena. To him are ascribed the Velluti and Crocifisso chapels at the church of S. Spirito; the organ, the chapels, and the interior façade of the church of Sta. Maria Maggiore; perhaps the tabernacle to the church of Sta. Maria Novella, and the two arcispedali there; the great chapel of S. Lorenzo (of which he only constructed the substructure); and two models which remained in the workshops of the cathedral for the front of Sta. Maria del Fiore; the façade and alterations (1592) to the church of SS. Trinità, including the presbiterio before the high altar, with the peculiarly formed stairs, and the fine cloister with new adjuncts to the monastery towards the Arno and the Parione, RUGGIERI, i, 43-46; the restoration, with a new front, of the palazzo Riccardi, in the via Maggio; the lower part of the façade (the rest was by Scamozzi or Nigetti) of that palazzo Strozzi which is towards the borgo degli Albizzi, RUGGIERI, ii, pl. 15-20; the façade and all the details of the palazzo Capponi, as illustrated by RUGGIERI, iii, 32-39, who also, 78-80, gives details from the palazzo Venturi; the palazzo Acciaiuoli, afterwards Corsini (RUGGIERI, ii, 37-40), in Prato; the palazzo Serguidi, afterwards Martelli, in the via del Cocomero, all in Florence; and the celebrated pulpit executed by his pupil, Silvani, in the church at Settignano. Besides being connected in many other public and private buildings in and round Florence, he was consulted as a military engineer at Naples, fortified Civitella del Tronto, planned the harbour, town, and two forts at Porto Ferrajo in the island of Elba, and designed the new fortress at Leghorn, and other fortifications in that city and at Pistoja, Prato, and Florence, for which last city he built in 1590 the fort called the Belvedere, having a small palazzo in the centre of it. Buontalenti, who was one of the first Italian architects that had a school of pupils in his own house (among whom

were his son Francesco, who succeeded him at Pratolino, Giulio Parigi, and Gherardo Silvani, died in poverty, 6 June, 1608, and was buried in the church of S. Nicolo' oltr' Arno. BALDINUCCI, *Notizie*, 8vo., Florence, 1846, ii, 490. 30.

BUONTEMPI, or BONTEMPI (MICHELE), and Gabriele Pestori, designed in 1256 the palazzo, now the Archivio Notarile, in the piazza di Sant' Agata at Cremona. 57.

BUONVISI (FRA GIOVANNI), in the seventeenth century restored the church of S. Romano in Lucca. 87.

BURBOCOA (MARTIN DE), with Martin Sagarcolo, finished in 1551 the Dominican monastery and church of S. Telmo, which had been commenced from the designs of Martin de Santiago in the city of S. Sebastian in Spain. 66.

BURGH (JACOB VAN DER), of Utrecht, is supposed to have completed the tower of the cathedral in that city (1482), and VAN BLESWEYK, *History of Delft*, says that the choir of the Nieuwe or S. Ursula Kirche in the same city was rebuilt by him in 1515. 24.

BURDIGALA. The Latin name for BORDEAUX in France.

BUREAU. The term adopted from the French language for a writing table, and also for a desk or secretaire, as well as for a chamber or office for the transaction of business.

BURGH (WILLIAM DE), was director of the works in 1237 at Windsor Castle. WALTER DE BURGH appears to have succeeded him in 1240, *Liberate Rolls*, 12 and 24 Henry III.

BURGH (THOMAS), was engineer and surveyor-general of fortifications and buildings in Ireland in 1724, and was concerned with sir William Piers in the erection of the façade towards College-green of the House of Commons at Dublin; MULVANY, *Life of Gandon*, 8vo., Dublin, 1846, p. 117.

BURGUGNA (FILIPPO DE), see VIGARNY (FELIPE).

BURGOS. The earliest capital of Old Castile in Spain. Its earliest remains are portions of the walls, and a plain brick gateway, with pointed horseshoe arch and angle turrets, on the north side of the city. The royal Cistercian convent of the Huelgas, about a mile outside the walls, is not open to male visitors without an order obtained with difficulty. It retains some late Romanesque work, the most interesting and elaborate example of which is to be seen in the small cloister, an arcaded quadrangle resembling very closely in its general detail and the rich capitals of its columns, the cloisters of Moissac, S. Trophime at Arles, and other late Romanesque works in the south of France. In the numerous courts and corridors of the convent are also preserved some very rich sepulchral monuments of about the same period.

The finest remains of the Early Gothic period are to be found in such parts of the cathedral dedicated to the Virgin (which was commenced in 1221 under bishop Maurice or Mauricio, who is stated to have been of English parentage), as the doorways of the transept, ornamented with that large and vigorous style of sculpture characteristic of the age; and as the main features of the magnificent cloisters which are rich in monumental sculpture, generally however of a later date. Various portions of the convent of the Huelgas are also to be classed under this head, especially the entrance porch; with a pointed bold molded arch, ornamented with Romanesque and Early Gothic detail; and also the large cloisters, which are characterised by the same transitional character.

There is but little work corresponding to the English Decorated period of the fourteenth century; for the transition here from a bold and massive style of Early Gothic character to the elaborate work of the fifteenth century is very abrupt. It is in examples of this latter epoch that Burgos is peculiarly rich, and the fanciful nature of Florid German Gothic is overpowered in this transplantation of the style under Juan de Colonia, by a certain solemn richness and grandeur peculiar to the Iberian character; such are the two very beautiful open worked spires of the cathedral façade, masterpieces of art and construction, built without any internal tie, one between the years 1442-56, the other immediately afterwards. The beautiful

chapel, 'del Condestable', erected by Simon, the son of Juan de Colonia, before 1512, is rich in ornamental and heraldic sculpture, engrailed and foliated arches and stained glass; several other chapels which stud this, the eastern end of the cathedral, are fine specimens of about the same period; whilst numerous other remains, more or less rich, of the same class, are to be seen in the suppressed monasteries of la Trinidad, Sta. Clara, San Pablo built by Juan Rodriguez, 1415-35, San Juan, and in different portions of the churches of San Esteban, San Lesmes, San Gil, and Sta. Ana. Burgos is moreover remarkably rich in monumental sculpture of this period, the cathedral and cloisters are filled with elaborate examples of Late Gothic art, and few are the churches of which the same may not be said; but by far the noblest works of this class are the alabaster monuments of Juan II and his consort Isabella, and of their son the Infante Alonzo, at the suppressed Carthusian monastery of Miraflores, about two miles outside the city; they were executed 1489-93 by Maestro Gil, father of the great sculptor Diego di Siloe. They are characterised by an extraordinary variety and fancy in design, and the most exquisite workmanship; and may be cited as amongst the finest works of monumental sculpture existing in Europe. The monastery itself, 1454-88, is also a good example of Late Gothic, and is another example of the architectural ability of Juan de Colonia, his successor Garcia Fernandez de Mattienzo, and Simon de Colonia. Amongst various remains of the domestic architecture of this epoch should be particularly mentioned the Casa del Condestable, called del Cordon, from the great cable ornament sculptured on its façade; the large quadrangle of which, with open galleries and beautiful balustrades, is still in good preservation. The examples of transitional Renaissance or "Plateresco", and pure Renaissance, are numerous in Burgos: by far the grandest example is to be seen in the octagonal *cimborio* or dome of the cathedral completed in 1567, from the designs of Felipe Vigarny or De Borgoña, in which the architect has combined, with remarkable judgment and taste, the features of Gothic art with details of the Revival. Other examples may be cited in the Puerta de Sta. Maria, about 1525, the Casa de Miranda, portions of the ruined monastery of La Trinidad, the fountain of the cathedral "parvis", the entrance court of las Huelgas, the monuments of Juan Cabeza de Vaca and his brother Don Pedro in the cathedral (Capilla de Santiago), of the Velascos in the Capilla del Condestable, the very beautiful stalls of the cathedral choir, with various mansions scattered throughout the town, and an innumerable quantity of monuments existing in the various churches and monasteries. Nor should be forgotten the very grand and elaborate *rejas* or iron gateways of the chapels of El Condestable, and of Santiago in the cathedral, the former a masterpiece of metal work by Christobal de Andino, in 1523; the great illuminated missals of the cathedral choir of the close of the fifteenth century; the various *retablos* or sculptured altarpieces of the cathedral (by Rodrigo and Martin de la Haya 1577-93), and of the churches; and what remains in the treasury of the cathedral (executed about 1587 by Juan de Arfe), consisting of chalices, crosses, censers, pixes, etc., of various periods. There are no modern erections which require or deserve any notice whatever. WARING, *Studies in Architectural, Sculptural, and Picturesque, in Burgos and its neighbourhood*, fol., London, 1852; a full account of the city is given in MADON, *Diet.*, 8vo., Madrid, 1847; and by WELLS, *Picturesque Antiq.*, 8vo., London, 1846, p. 28-77. A plan of the cathedral is given by PONZ, *Viage*, 12mo., Madrid, 1785, xii, 26. The reader is cautioned against incorrectness and exaggeration in VILLAMIL, *L'Espagne Artistique*, etc., fol., Paris, 1842-50; MOYEN AGE, etc., pl. 142, 223, 275; TAYLOR, *Voy. Pit.*, 4to., Paris, 1826, p. 73, pl. 7-10.

J. B. W.

BURHAM LIME, see HALLING LIME.

BURIAL GROUND, see CEMETERY.

BURLINGTON (LORD), see BOYLE (RICHARD).

BURNETTIZING. The popular name for the application of Burnett's patent (1838) for the preservation of timber, canvas, cordage, etc., by means of the chloride, or as it is more commonly called muriate, of zinc. The effects ascribed to this material, in the application to the Privy Council for an extension of the patent 7 Feb., 1852 (which was renewed for seven years), are that it hardens and improves the texture by entering into immediate and permanent chemical combination with the ligneous fibre; and that no amount of washing in boiling water will remove that combination; it is also asserted by the patentee that no efflorescence takes place; that wood and other articles are preserved from the adherence of animal and vegetable parasites, as well as from the attacks of insects and of the wet and dry rot; and that when used of sufficient strength, it renders ligneous materials uninflamable. It is sold (1855-6) at five shillings per gallon; or a charge of twelve shillings per load is made at the works.

BURNT CARMINE, SIENA, UMBER, VERDIGRIS, see CARMINE, SIENA, UMBER, VERDIGRIS.

BURR. Bricks fused together in the clamp from over firing; BRICK, MANUFACTURE OF, pp. 138 and 140.

BURR'S TIMBER BRIDGE. Planks from 35 to 50 ft. in length, 4 ins. thick, and 12 ins. wide, repeated one over the other, breaking joints, until they form a depth of 3 ft. through, and rising from the chord line in the proportion of 13 ft. in 100, form each section or rib of the bridge. The entire width, 36 ft., is made by five of these sections, and the roadways are suspended from these arcs by means of iron chains or links. Wing arches 30 ft. long are placed outside the exterior ribs, so as to give a bearing of 52 ft. on each pier, while tie-beams and diagonal braces carry a lattice-work roof to the whole erection. The swinging motion of the platform is obviated by the wing arches, and by braces in the ribs, and the several feet of the arches are tied together by beams which carry an upright bracing. Such is the bridge, finished Feb. 1806, at Trenton over the river Delaware in New Jersey, engraved by Busby, London, 1821. The centre span is 200 ft. between two others of 180 ft., and two more of 160 ft. each.

BURROUGH incorrectly written **BOROUGH** and **BURROUGHS** (SIR JAMES), became LL.D., Master of Gonville and Caius College at Cambridge in 1754, and died in 1764. His portrait by Heins is in the College. He is said to have designed, or to have been consulted upon, all the public buildings erected in his time in his University, and to have constructed the chapel of Clare Hall, of which the first stone was laid in 1763. **DALLAWAY**, *Anecdotes*, 8vo., London, 1800, pp. 99-112, affirms, "to all that is excellent in the architecture of the Senate-house, sir James Burrough has the better claim. The executive part was superintended by Gibbs;" whereas other writers state that the east end of the Senate-house, built in 1775, was adopted by Gibbs from his idea. The Corinthian altar screen lately removed from Canterbury cathedral was designed by him in 1729 (WILKES). William Essex was reputed to have been his pupil.

BURSA, in Anadolia, see BROUSSA.

BURSE or **BOURSE.** The old name for an EXCHANGE.

BURY STONE. A strong serviceable sandstone quarried in the neighbourhood of Bury in Lancashire. The Assembly Rooms (1850) and the Athenæum (1851), erected by Mr. Sydney Smirke, A.R.A., are the principal buildings in the town where it has been employed. It does not possess uniformity of tone, and has the defect common to most of the stone obtained from the coal measures, of being stained by iron, and sometimes by carbonaceous matter; when great care is taken in the selection of the blocks, it is an excellent building material. s. s.

BUSCA (GABRIO) is entered about the year 1560 on the list of architects to the cathedral at Milan. 27.

BUSCHPERGER (MARTIN) of Osnabruck was engaged between the years 1208-30 on the eastern side of the *Kaiserlicherburg* at Vienna. 26.

BUSCO or **BAUSCHEK**, the son of Leonhard, was archdeacon

of Kaurzim, and is named in an inscription in the cathedral of S. Vcet, at Prague, as "Busco archidiaconus Curimensis canonicus Pragensis primus fabricæ director: obiit 1350."

BUSHEL. An imperial measure (since 1 January 1826) for liquids and dry goods, containing when struck 2218.192 cubic inches; but for potatoes, fruit, and similar goods, when heaped, it contains 2815½ nearly. The old ale gallon made a bushel of 2256, and the old corn or Winchester bushel, struck 2150.42, or heaped 2820 cubic inches. The old standard measure at Guildhall was 2145.6 cubic inches. An imperial bushel averages, of Portland cement 112, coal 94 to 88, Roman cement 73, cloverseed 68, peas 64, beans 63, wheat 60, salt or flour 56, rye 53, rapeseed 48, barley 50 to 47, and oats 40 to 38 lbs. in weight. A bushel of malt of the old measure, or 2256 inches per bushel, weighs about 39 lbs., and the same quantity of water about 78 lbs. A bushel of mortar passed for two hods. A bushel of lime is also called a BAG of lime: 21 struck, or 17 called 18, heaped imperial bushels, are supposed to form a cubic yard, and are considered as a single load. 13.

BUSKETUS or **BUSCHETTO.** The building of the church of S. Paolo at Pistoja in 1032 is attributed to him by WEBB, *Sketches*, 8vo., London, 1848; and he erected in 1063 the cathedral at Pisa, according to the inscriptions given by CICONARA, *Storia*, fol., Venice, 1818, i, 174-83, who shows that VASARI was mistaken in asserting that Buschetto was a Greek born at Dulichium.

BUSSE'S WROUGHT IRON BRIDGE, is in effect a trussed T girder. Several girders made up of pieces of T iron with two or three plates between them, stretch from pier to pier, while as many bars linked together pass underneath, and are kept at a distance below the girder by two pieces of iron acting like legs, a screw-joint in the middle giving the opportunity of tightening this truss-rod at pleasure. Above the girder is a lattice-work about 20 feet in height, affording additional security; but it was suggested by the inventor merely for the purpose of suspending a second roadway near the top of the lattice. The piers are arranged with a series of plates meeting on edge, and forming a kind of pyramid about four times as high as the width of its base, or rising as the inventor calculates between 200 and 300 feet in height; WARR, *Dynamics*, 8vo., London, 1851, p. 182.

BUSTAMANTE (EL PADRE BARTOLOMÉ) was born about 1492 at Quijas near Santillana. He studied at Alcalá de Henares, was made curate of Carabaña, where he built the church in 1528; entered the Society of Jesuits about 1552, and gave the plans for the colleges of Cadiz, Caravaca, Segura, Trigueros, and that at Murcia finished in 1569. For the cardinal Juan de Tavera, archbishop of Toledo, he designed the magnificent hospital of S. Juan Bautista, called Afuera, near Toledo, which was commenced in 1542, but executed after 1549 under other architects; and probably the portal with four columns of the Doric order to the archiepiscopal palace in that city. He died 21 June 1570 at Trigueros, where he had gone to finish the church. The church of the Jesuits' college at Seville, 1565-79, is ascribed to him on account of its resemblance to that of the hospital at Toledo. He must not be confounded with BUSTAMANTE DE HERRERA, who was inspector of the public works between the years 1543 and 1551. 66.

BUSTY. The name given in India to that class of temples of the Jain sect, which is always covered with a roof, and generally contains images of the twenty-four saints of that sect. Two such temples at Barcuru date A.D. 155, and the ruins of another at that place are considered by BUCHANAN, *Journey through Mysore*, 4to., London, 1807, iii, 74, 82, 132, to be superior to anything that he had seen in India for the workmanship of the pillars and carving.

BUTACA (MATHEOS), see BOYTACA.

BUTCHERY, see *Detached Essay*, ABATTOIR.

BUTEA FRONDOSA (*potash*). A wood of Gualpara, East Indies, open, soft, but tough, and used for common furniture.

In Cuddapah it is called *palan* or *pallas*, the wood of this beautiful and useful tree is hardly distinguishable from teak, the timber is large, but it is almost always knotted and gnarled. 71.

BUTIO, see BUZZI (CARLO).

BUTLER'S PANTRY. The apartment, in a mansion, especially appropriated to the duties of the butler as connected with the custody and maintenance of the various services. As a man servant is often required to sleep near the PLATE CLOSET, the bedroom becomes a necessary adjunct to the pantry. In a large establishment the butler will require a room to himself, besides a bedroom, and another for his subordinates. These offices should be near the housekeeper's room and out of the way of the back entrance to the house. The fittings required are a dresser with drawers; a sink; an ice closet; a napkin press; and closets for glass, china, and lamps.

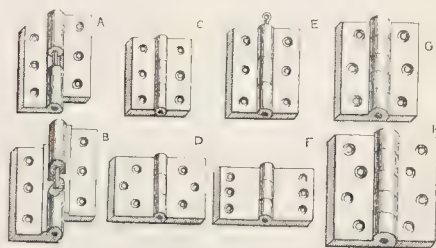
BUTMENT, see ABUTMENT and ARCH.

BUTMENT CHEEKS. The two solid parts on each side of a MORTICE.

BUTT END. The root end of a piece of timber.

BUTTERY. The storehouse for bread, butter, cheese, and beer, in Mediæval dwellings, where, directly behind the screen extending the whole breadth of the great hall and facing the upper end, were doorways, generally corresponding to the openings in the screen. At Haddon Hall, in Derbyshire, "the first of these still retains its ancient door of strong oak with a little wicket in the middle, just big enough to put a trencher in or out; and was clearly the butler's station; for the room within still retains a vast old chest of oak, with divisions for bread; a large old cupboard for cheese; and a number of shelves for butter"; KING, *Observations on Ancient Castles*, in the *ARCHÆOLOGIA*, vi, 348, describes the arrangement of the attached brewhouse and bakehouse. The other archways gave admission to the offices of the cook, the cellarer, and the chamberlain.

BUTT HINGE, also called **EDGE BUTT**. A hinge of either wrought or cast metal, in which the *toils* or flaps close like a book. When the knuckle is composed of a single tenon and mortice, as c, d, e, and f, it is called single-jointed; with two tenons and three mortices it is double-jointed, as g and h. The common, good, and best single-jointed cast butts, as c, rise by a quarter of an inch from 1 inch to 4, 4½, 5, and 6 inches; the same double-jointed, as g, rise in the same way from 2 to 4½, 5, 5½, 6, and 7 inches. Common cast butts cost about two-thirds of the price of the best; those with pressed riveted joints are cheapest; those which have been opened, and are called loose joint hinges, are charged one penny per pair extra. A cast butt has lately been introduced having loose wrought iron washers between the parts of the knuckle, to reduce friction.



Loose pin butts where the rivet draws out, as e, seem to have been the precursors of heave-off or lift-off butts, as A (which sometimes have turned ends), and of rising or skew butts as n: when the knuckle is only split in one place, they are frequently used for folding doors that are wanted to be removable; there are others split in more pieces, and not to be lifted off. Loose pin butts are made of sizes increasing by a quarter of an inch from 1½ inches up to 3, 3½, 4, 5, and 5½ inches; the heave-off butts stop at four inches. Patent cast rising or skew butts rise in the same way from 2½ to 3½, 4, 4½, and 5 inches; the 3, 3½, 4, and 4½ inches are also made of an extra

breadth. Square butts, like d, rise by eighths of an inch from 1½ to 2 and 2½ inches. Broad butts, as h, are made 2×2, 2×2½, 2½×2½, 2½×3, 3×3, 3×3½, 3×4, 3½×3½, 3½×4, 3½×4½, 4×4, 4×4½, 4×5, 4½×4½, 4½×5, 5×5, and 6×6 inches. Pew butts, as f, are made 2, 2½, and 2½ inches. Back flaps which resemble d, but are much lighter, rise by eighths of an inch from ¾ to 2, and 2½ inches. PROJECTING BUTTS are used for letting doors lie back parallel with the wall, where there is a projecting architrave. PARLIAMENT HINGES, H, HL, and CROSS GARNET HINGES, form varieties of the above.

BUTTING or **BOTENTINE.** The name given to hillocks raised on purpose to mark boundaries of properties. **ABUTTAL.**

BUTTING JOINT, see **ABUTTING JOINT.**

BUTTON, see **PATERA.**

BUTTON. A piece of wood or metal turning on a centre used to fasten the door of a closet; it sometimes moves on a circular plate in two unequal segments, the smaller one being screwed to the door to save it from being worn.



The same term is also given in joiners' work to blocks fastened at distances with nails to the back of an architrave, for the purpose of bringing the stuff for its molding in contact with it until after the glue is set, the buttons being then knocked off cause the nails to be drawn, after which the molding is struck or stuck.

In order to prevent joiners' work, such as a panel, from winding, it is sometimes fastened to a button by a long screw which works in and through a slot made for that purpose in battens fixed to the framing.

The round head serving as a handle to move the bolt of a lock or bolt is also called a **BUTTON**.

BUTTON WOOD, see **PLATANUS.**

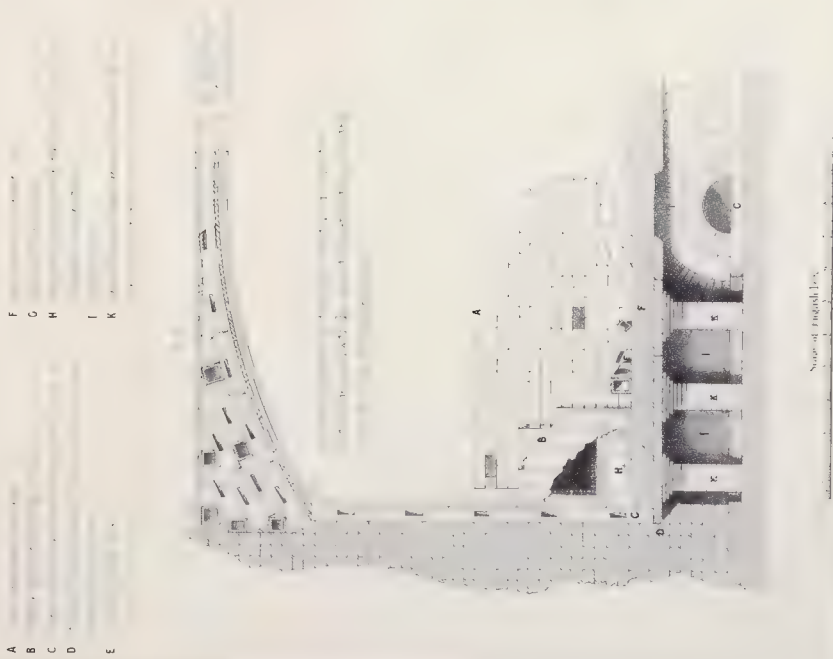
BUTTRESS (Lat. *abamurus*; It. *puntello*; Sp. *puntol*; Fr. *contrefort*). A projection made on the exterior of a wall to increase its stability with the least quantity of material, or to resist an internal thrust to which it may be exposed. The term **COUNTERFORT** (Fr. *contrefort*) applies when the projection is placed upon the inner side. In bridges, however, the counterforts occasionally resist displacement in both directions; although their principal office appears to be to resist the thrust of the arch, and for this reason the name may be retained consistently with the definition given above. The authors who have treated upon the stability of buildings do not usually consider that either buttresses or counterforts increase the strength of a wall more than the same cubical quantity of materials would do, if applied equally upon the whole length in a uniform thickness; but it is known that these additions produce practically a far greater effect than such a theory would indicate, even if they act only by subdividing the effort to which the length of the wall is exposed. BELIDOR, *La Science des Ingénieurs*, 4to., Paris, 1830; RONDELET and BLOUET, *Traité de l'Art de Bâtir*, 10th edit., 4to., Paris, 1852; GARIDEL, *Tables des Poussées des Voutes*; MAYNIEL et PRONY, *Traité de la Poussée des Terres*; PONCELET, *Mémoire de l'Officier de Génie*; MOSELEY, *Engineering and Architecture*, 8vo., 1843; WEISBACH, *Mechanics of Engineering*, etc., translated in *Library of Illustrated Scientific Works*, ii and v, 8vo., 1846; BARLOW, *Appendix to TREDGOLD, Carpentry*; WARE, *Faults and Bridges*, 8vo., 1822; MURRAY, *Stability of Retaining Walls*. G. R. B.

During the Norman Period of Mediæval art the buttress is only a pier having more breadth than projection, finished either by stopping at the cornice tablet; or with a water table, plain as at Clymington church in Sussex, where there is a window in the pier; or having a drip-stone and throating; it also ends with a slope each way, sometimes having beads at the top; or with a roll-ridge on a gablet, the pier having a set-off on each side. In general the buttress is uniform in width and thickness from the base moldings upwards, except where it is broken by tablets and string-courses; it is decorated in numerous ex-

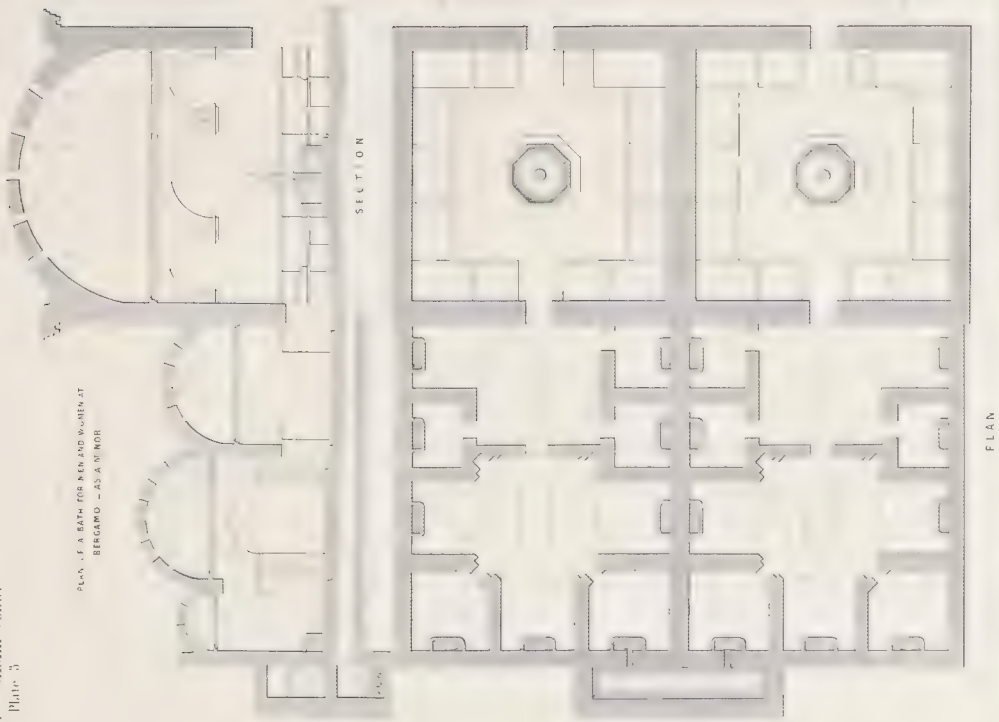
BATHS AND WASHHOUSES.

Plate 3.

SECTION OF THE HYPOCAUST AND OF ONE OF THE CHAMBERS
OF THE ANCIENT ROMAN BATHS AT AUGUSTÆ, B.C. 14 (AUGUSTA RAUACORUM).



PLAN OF A BATH FOR MEN AND WOMEN AT
BERGAMO - AD A.M. 1000.



SECTION

PLAN

STREET



BUTTRESS

TRFNT
No 2, School St
W. W. W. W.

HAUTZEN Cathedral

VENICE, Santa Maria
della Salute

ALFRED Saladin, South Front

ERASTED Jarch KENT

J.W. W. W.

THOMAS

W. W.



amples of late date, with shafts set in recesses at the corners; in addition to these shafts, small series of arches are sometimes used; and the edges of the recesses are worked with a serrated edge. A second buttress of less breadth is often placed on the front of the broad flat ones. A polygonal-sided buttress occurs, in which the top slopes every way from a throating to a point: a semicircular pier with a conical top is seen at S. Remi at Reims in France, as well as at S. Peter's in Northampton, where an angle buttress consists of three such rounded and staged piers in a group; there is a half-round pier upon the face of a slightly projecting buttress at the keep of the castle of Loches in Touraine in France.

The buttress of the Early English Period has less width, but more decided projection than the examples above mentioned; it consequently finishes with a steep plain slope rising from a throating and dying into the wall; where small stones are used the slope is divided into set-offs; and several examples occur of two stages of projection separated by another slope of set-offs. The use of small shafts at the angles was continued in this Period, while examples exist of chamfered corners: these buttresses exhibit the gabled head of the former Period, or else a gablet rising from the throating, and enriched with niches, cusping, or incipient tracery: chamfered buttresses with gabled caps, differ by having a throating at the bottom of the gable. These heads or caps stand below the parapet, against it, or even above it; but when so detached, the head often slopes each way, and forms a kind of pinnacle. The very slim character of some examples should be noticed, as well as the diagonal position of others: pinnacles are rare, they are however to be seen on the south side of the cathedral at Secz, and on the north side of that at Auxerre in France.

In the Decorated Period the buttress is seen without as well as with stages: in the former case it is still chamfered, ending at top with a weather table from a throating; or a gablet; or else it is recessed in front for a niche with a crocketed head between pinnacles under the gablet sometimes also crocketed between pinnacles. When it has one or more stages weather tabled from a throating, these stages have sometimes chamfers at the angles, at other times shafts. When finished with a gablet and fleur-de-lis ridge, the buttress has chamfers at the angles, and a trefoiled panel on the face: the panel becomes a niche: the niche is placed on the side instead of on the face: some buttresses are worked in two stages with a gablet to each, enriched with tracery. The corner buttress, placed diagonally with the walls, becomes common in works of this Period; and is sometimes found rising from two others that are at right angles with the walls. The buttresses at Merton College chapel in Oxford, those at the east end of Howden church in Yorkshire, and those at the west front of York cathedral, may be taken to show respectively the richness of such works; while for the number of stages, the plain buttresses at Bloxham church in Oxfordshire, and at Finedon church in Northamptonshire, deserve consideration.

The buttress placed diagonally is the *franche botras* mentioned in the contract for building Catterick church.

In the Perpendicular Period the buttress is generally higher, and projects more in proportion to its width, than in the preceding Periods. It is more frequently panelled, rich instances of which exist at Lavenham church in Suffolk, and at the divinity schools in Oxford: the stages are separated either by plain slopes or by set-offs of the usual character, but Lavenham and the church of S. Lawrence at Evesham offer examples of molded slopes: the triangular head is much less used; otherwise there is not much difference from the buttress of the previous Period, in that of its successor which frequently finishes with pinnacles that, when square on plan, are commonly set diagonally. The small eastern addition to Peterborough cathedral has statues instead of pinnacles. The diagonal corner buttress is not common; but the two corner square buttresses leave an angle pier, which is itself crowned with a pinnacle.

ARCH. PUB. SOC.

This idea is constant in internal work where the square pier or cors, only used to sustain a vertical weight and generally set with an angle forwards, has on each face a small slim buttress, and this is properly a *body boterasse*; which when inserted in the angle formed by a cors and a wall is sometimes termed a *corner boterasse*. BASE OF A WALL; FLYING BUTTRESS; WEATHER TABLE. Examples of each variation above mentioned will be found in BRANDON, *Analysis*; BRITTON, *Dict.*; RICKMAN, *Attempt*, etc., 5th edit.; and the GLOSSARY, 5th edit.

The buttress, originally a "strip pilaster" with a capital and sometimes a base as at the church of Thor in France, became a shallow pier: in Italy the brilliant effect of the slightest projection kept this pier almost invariably shallow, while in the North the necessity for the bold effect arising from great projection led to the use and abuse of the attached buttress. Except in cases like the coupled and engaged columns forming one pier as at Basse Chauvigny in France, or the detached column carrying a water-table as at an oratory near Avallon, also in France, there is not much obvious difference from English examples in projecting buttresses such as those at Friburg, Marburg, and Worms; but the striking difference in other continental examples arises from the small projection of the water-tables, the great use of string-tablets, and the general treatment of the pier as the base of a pinnacle; this is especially evident in the flying buttresses. *Illustrations*, Buttress, plate 126.

BUXUS, Boxwood. This wood is distinguished as Turkey or European; the former *B. balcarica*, is imported from Constantinople, Smyrna, and the Black sea, in logs from 2 feet to 6 feet long, and from 2½ inches to 14 inches in diameter; 4 feet in length and 10 inches in diameter being the general average. The wood is of a yellow colour inclining to orange, but differs according to the age and season at which it is cut.

B. sempervirens, common evergreen box, the English boxwood, is plentiful at Boxhill in Surrey, and in Gloucestershire. It is more curly in growth, and softer and paler than the Turkish: its usual diameter is from 1 inch to 5 inches, and it only attains a diameter of 1½ to 2 inches in a space of twenty to twenty-five years. Being tougher than foreign box, it is used for common turnery. A similar wood is known in America as tugmutton. European boxwood is imported from Leghorn (*bossolo*), Galicia, and Portugal; it weighs about 60 lbs. per cubic foot. *B. emarginatus* of Dr. Wallich is found of considerable size and thickness in the Himalayas; it is similar to the above species, but softer.

W. H.

BUZZI, or BUTIO, from the Latin form Butius (CARLO), is entered under the date 26 August 1638, in the list of architects to the cathedral at Milan: his two designs in a Pointed style for the façade of that edifice are still preserved; an engraving of one of these is in the library of the Institute of British Architects. He was employed upon the sacristy of the church of Sta. Maria in Navicella at Rome; *MUS. BRIT. ADD. MSS.* 8502. He died in September 1658.

27.

BUZZI (LELIO) is entered in the list of architects to the cathedral at Milan about 1600 to 1603. He was consulted upon the design for the cathedral at Brescia, and his report is given by ZAMBONI, *Memorie*, fol., Brescia, 1778, p. 153.

27.

BYARD (PIERRE), see BIARD (PIERRE).

BYBLUS. A city of Phœnicia now called Jubeil. It contains the nearly perfect seats of a Roman theatre 150 feet wide externally; *Bibliotheca Sacra*, v, 259. Roman imperial coins represent temples at this place to the Syrian Venus.

BY-POLE, or PY-POLE. For raising heavy weights where fixed scaffolding would involve too much cost, a single pole is sometimes used, fixed and retained in a vertical position by two or more *guy ropes* or *guys* fixed to the top of it, the other ends of which are secured below in opposite directions. A block with a sheave is made fast to the top of this pole, and another block with a sheave, called the *snatch block*, is fixed to the lower part near the ground to guide the hauling rope, called the *fall*, upward close to the pole. The blocks and hauling-

A A

rope together are called the *tackle*. When the materials to be raised are of an unwieldy form, or liable to injury by striking against the pole, a second one is lashed at the lower part, and projects above in the manner of a jib of a crane, being secured by a lashing of strong rope; these form a DERRICK.

BYRE, see CATTLE SHED.

BYRSONEMA LUCIDA (Sp. *carne de donzella*). A very dense wood of Cuba.

71.
BYZANTINE (OR NEO-GREEK) ARCHITECTURE. The name given to a style resulting from debased classic art modified by oriental influences. The term has generally been loosely employed; but it has a special and limited application to the style disseminated with Christianity from Byzantium. For the erection A.D. 328 of the new Byzantium, Constantine could only obtain the best masons of an age in which there were no artists; and these workmen were ignorant of fine art, and were incapable of original design, or even of perfect execution. An edict, consequently promulgated by Constantine in 334, provided for the establishment of provincial schools of art; materials were taken from even recent edifices: the Romano-Grecian-Asiatic styles were flourishing about the period of the migration of Sassanide subjects to Constantinople in 410-420; these circumstances, without the probable effects of the return of the Greek prisoners from Persia in 628, and without any other causes, were sufficient to produce the change of art into two great branches, which are respectively termed the Latin debased Roman, or ROMANESQUE, and the Greek debased Roman now under consideration.

The edifices constructed during the first stage of the style (300-500) exhibit gabled or lean-to roofs, covering buildings in which the entablatures and columns have lost somewhat of their classic proportion, but retain like the few dressings that are used deeply-cut moldings with essentially Greek, not Roman, foliage and details. This stage will be traced through the church of S. George at Salonica, perhaps about 400; and through that of S. Johannes at Constantinople, 463 (SALZENBERG); to the edifices constructed in that city by Justinian.

The buildings of the second period (500-800) exhibit domes and semi-domes on terraced or nearly flat roofs; the vaults are pierced with windows and are divided by horizontal bands of ornament; the use of pendentives becomes systematic; the larger pillars are square, because antique materials have become scarce; the column begins to be merely a decorative accessory; and while the details are more orientalized they are either in very low relief, or consist of faces in which the ground of the ornament is sunk from the general surface of the work. This phase of Byzantine art may be seen in the churches of Sta. Sophia, 532-38, of SS. Sergios and Bacchos, commonly called the lesser Sta. Sophia, and of Sta. Irene, eighth century, at Constantinople (SALZENBERG).

The structures of the third period, 800-1200, exhibit externally only the upper portions of the domes rising from tambours upon the pedimented and gabled fronts of vaulted buildings, the exterior of which, as in several works of the preceding period, absorbed much of the decoration lavished previous to the Iconoclastic disputes upon the interior. The oriental influence in ornamentation is still more visible; and the lace, braid, and gold tissue-work of the time is reproduced in peculiarly flat decoration upon grounds sunk from the general surface of the work. To this period belong the hall on the Hebdomon, and the churches of S. Theotokos (ninth century), and of S. Pantokrator (twelfth century) at Constantinople (SALZENBERG).

The style had already been introduced at Mecca, when Syrian, *i.e.*, Byzantine, artists were sent to rebuild the Mosque at Medina in 705; a chapel, near the cathedral at Paderborn, was constructed "per Græcos operarios" for the standard-bearer of that Charlemagne (768-814), who was in constant communication with the East, and whose descendant, Charles le Chauve (840-877) employed artists from Greece and Asia Minor. DE CAUMONT, *Cours*, 8vo., Paris, 1830, iv, 119, regards the influences of Byzantine art in Germany and Italy, as only partial innovations; and although it has been stated that Byzantine art penetrated through the descendants of the Greek colony of Marseilles into France, RAMÉE, *Histoire*, 12mo., Paris, 1843, ii, 151, observes that MALLAY, *Essai*, fol., Moulins, 1838-41, is wrong in applying the term Byzantine to some churches in France; and VERNELH, *Architectures Byzantine*, 4to., Paris, 1852, is open to the same observation which is made at considerable length by BERRY, in GAILHABAUD, *Monuments*, vol. ii, on the church of S. Front at Périgueux.

In other departments of art, the Byzantines, although laying the foundations of what followed, scarcely rose above mere mechanical excellence in ingenious combinations of form and colour; but these were simply symbolical or conventional, and entirely destitute of the ideal stamp which is the true and highest characteristic of art, and which it was reserved for their Italian successors to develop.

Papers read at the Royal Institute of British Architects 1855, on the work by SALZENBERG, *Alt Christliche bauldenkmale*, fol., Berlin, 1854, by C. C. Nelson and M. D. Wyatt; FOSSATI, *Aya Sofia*, fol., London, 1852; COUCHAUD, *Choix d'églises Byzantines en Grèce*, fol., Paris, 1842.

BYZANTINE ARMENIAN. A style introduced by the artists and workmen who were sent (as his predecessors had sent them since the year 820 to Spain) by the emperor Romanus Argyrus (1000-50) to his son-in-law, the Georgian prince Bagrat IV (1027-72), as well as to the Russian prince Jaroslav. The style is best studied in the cathedral church at KOUTAIS, founded 1008-14, and finished 1072. ARMENIAN ARCHITECTURE. 91.

BYZANTINE PERSIC, or ARMENO-PERSIC with an infusion of Byzantine art. It is generally asserted that after the death of Tiridates III, Armenian architecture reverted to a traditional art, which, by its massive forms and luxury of ornament and detail, recalls the porticos of Persepolis; and that by combining this with the requirements and forms of the Christian churches, they created a style of sacred architecture peculiar to themselves. The total absence of bricks is a mark of Armenian work of that period, although at the same time Byzantine artists were elsewhere always using them, both in alternate courses with stone and in the interior of their edifices. 91.

BYZANTINE SARACENIC, or SARACENIC with an infusion of Byzantine art; the *Arabe-Mauresque* of GIRAULT DE PRANGÉY. Portions of the style to which this name has been generally applied may be seen at Seville, dating from the end of the twelfth century, where the horse-shoe arch and the arch with several foils or lobes, seen in the later portions (965) of the Mosque at Cordova, alternate with the pointed arch, but still rest upon capitals and columns of an antique style. ARAB ARCHITECTURE. ARABO-MOESCO.

BYZANTIUM, see CONSTANTINOPLE.

BYZANTIUM (JOHANNES OF), with Isidorus of Miletus, completed all the works of fortification and embellishment under Justinian (527-65) to the city of Zenobia on the Euphrates; PROCOPIUS, *De Edificiis*, ii, 8.

BATHS AND WASHHOUSES.

(Reprinted from the Papers of the Architectural Publication Society.)

BATHS (ANCIENT). In the early stages of civilization there is no doubt that the only form of bathing used was the simple plunge into a river, or clear pool. In severe weather this would be too cold for the sick and infirm; and as society advanced in the arts of life, the improvements in constructing pottery or metal vessels no doubt suggested to these persons the use of warm water; and as luxury generally increases as the means of indulgence are discovered, it is probable the healthy in cold weather also availed themselves of the invention. As early as Homer's days, it is evident, from the speech of Alcinoüs to Ulysses (*Odyssey* viii, 249) the warm baths, *λοῦτρα τε θερμὰ*, were considered effeminate, and as late as those of Aristophanes, in the memorable contest between "Reason" and "Quibble" (as the *εἰκασις λόγος* and *ἀδίκος λόγος* may be translated, *Nubes*, 879), it is evident that feeling lingered long in the minds of the Greeks. As population grew denser it was more difficult to preserve the decencies of life, and separate bath-rooms were used; and the economy and convenience of uniting single buildings into large public establishments gave origin to those noble piles, the principal ornaments of cities of the Roman world.

Lavers (כִּיֹּר) of brass among the Jews (*Exodus* xxxviii, 8), are noticed, but neither in the Scripture nor the Apocrypha, are separate establishments mentioned. The Egyptians were forbidden (*Diodorus* I, 72) to bathe while in mourning; but SIR GARDNER WILKINSON confesses there is but little knowledge of their baths: he gives (*Manners and Customs of the Ancient Egyptians*, vol. iii, 389) an engraving from a tomb at Thebes, representing a lady kneeling in a shallow vessel, while her attendants pour water on her, and seem to be rubbing her arms and shoulders. In the classic authors we have numerous and copious allusions to the subject, which have excited the greatest attention and closest controversy.

Confining the investigations as much as possible to the buildings and apparatus, an attempt will be first made to give a short sketch of the etymology of the terms used by the ancients, and what is known of the history of these establishments; afterwards to endeavour to elucidate at greater length their architectural and engineering features.

Baths were called by the Greeks *ασάμυνθος*, *βαδυνεῖον*, *ἐμβασίς*, *λοετρόν*, *λουτρόν*, *πύελος*, and *πύριον* or *πυρίμαστιον*. Πλάνος has another meaning, to be explained presently.

Ασάμυνθος, probably from *ἀσις*, mud, dirt, because the bath removes it, is a word frequently used by HOMER. When Ulysses and Diomedes return from the night expedition (*Iliad* x, 574), they first bathe in the sea, and next in the *ασάμυνθος ἑξέστας*, "polished baths," they then are anointed with rich oil. When Ulysses bathes in Circe's palace (*Od.* x, 359 *et seq.*) one of her attendants "brought water, and kindled fire, and heated much water on a great tripod, but when the water bubbled in the shining brass, sitting in the *ασάμυνθος*, she poured from the great tripod, sweetly mixing [the hot and cold water] and bathed my head and my shoulders, that from me she might take away the mind-wasting labour, but when I was washed I was anointed with fat oil." It is probable this vessel was something like the Roman "labrum" in which the bathers sat and had water poured on them from different vessels. ATHENÆUS (I *pag.* 24, *Ed. Casaub.*) alluding to this passage of HOMER, calls the

ασάμυνθος *ἐμβασίς*. This last is a common word for a shoe, and would lead to the notion that the vessel was of long form—in fact a sort of slipper-bath. JULIUS POLLUX (*Onomas*, 10, 64, 65, *Ed. Hemsterhuis*;) in a much corrupted passage, seems to infer that *ασάμυνθος* is the same as *λέβης*; but he says in the next sentence that in "the Heroes" of CRATINUS, *ασάμυνθος* signifies a chest, and that some suppose it to be a sort of cup, *κιβατήν νοοῦσιν*, *ἐνίοι δὲ ἔκπωμα*. The same author, treating of cups (*Onomas*, lib. vi, 97, 99) considers the *ασάμυνθος* given to Menelaus (*Odys.* iv, 128) to be a species of *χάλις*, but this seems quite begging the question. Nothing in the context points to cups more than to any other vessel. He also cites CRATINUS (*Chirones*) *Ἐξ ασάμυνθον κύλικον λείβων*; but as the play is lost there is no context to guide one in so short a passage.

Βαλυνεῖον, "derived," says the ETYMOLOGICON MAGNUM (*sub voce*) "as *ιατρῆιον*, from *ιατράν*, seems to have been the name of the bath-room rather than of the bath itself, (see *Equites*, 1055, cited further on) and is stated on the authority of SUIDAS (*sub voce*) to be derived from *βάλανος*, an acorn, because the baths were heated by burning the cups, etc., of the acorns, the fruit itself being eaten in those days as food. Others have derived it partly from a passage in S. AUGUSTINE (*Confessions*, cap. 12) from *βαλλειν*, "quia pellat anxietatem animi:" this seems a far-fetched reason, and as PHILANDER (see his notes to the folio Elzevir VITRUVIUS, p. 95) says "cui sententia refragatur orthographia." Be its derivation what it may, it is no doubt the etymology of the Roman terms "Balineum," "Balineæ," contracted to "Balinium," "Balneæ." The other Roman word "Thermæ" is derived from the Greek adjective for "warm" (*sc.*) baths, as a glance will show.

Ἐμβασίς has already been mentioned.

Λοετρόν, and *λουτρόν*, are of course directly derived from *λοεω*, the Homeric form of *λοῦω*, to wash. Some critics have considered *λουτρόν* to signify a warm bath, and the *ασάμυνθος* to signify a cold bath, but VITRUVIUS (lib. v. cap. ii.) says distinctly "frigida lavatio quam Græci 'λουτρόν' vocitant," and that which much strengthens his testimony, HOMER (*Iliad*, xviii, 489) speaks of "λοετρόν Ωκεανόιο." The *Ἡράκλεια λουτρά* were warm baths. There is a tradition that they were natural warm baths shown to Hercules by Pallas (see the Scholiast on the before-cited passage of the *Nubes*, 1033.)

Πύελος, this HEN. STEPHENS derives from *πύσις* or *πυρῖσις*, a vessel made for the fire. The Scholiast, on Aristophanes *Equites* 1055, says *πύελον τὰς ἐμβάσεις*, the same word which Athenæus considered equivalent to the *ασάμυνθος* of Homer. The Scholiast goes on to describe it as "a hollow vessel, *πύελος γάρ ὀνυγμα*, where people are washed," and JULIUS POLLUX (vii. 166-169) seems to consider it the same.

This author also speaks of the last sort of bath, *πυρία*, as described by HERODOTUS, and *πυριάματα* as described by PHILISTUS. Of the latter author there are no remains: the former describes the *πυρία* thus (*Melpomene* 74). He states the Scythians set up three sticks and cover them with cloth like a tent; they place a quantity of red-hot stones under this covering, and taking some handfuls of the seeds of a species of hemp, they creep in under the covering, and throw the seeds on the red-hot stones, so that a smoke arises thence such as no Greek *πυρῖν* vapour-bath, could exceed; that they rejoice so in this vapour they shout

aloud; that this is their bath, λουτήριον, and that they never bathe their bodies in water.

There are thus three sorts of baths described—cold, hot, and vapour. The Lacedæmonians seem to have bathed daily in the Eurotas, however cold the weather might be, and the versatile ALCIBIADES (*Plut. in vitâ*) seems to have excited their admiration by falling in with this custom. They seem also to have used a dry sweating-bath to a great extent, called from thence “laconicum,” and which will be hereafter described.

The other species of bathing seems to have been like that described in the *Odyssey*, the sitting in a large vessel, and having hot or cold water poured on the body by attendants, from vessels called ἀρίτανα or ἀρίβαλλος—these are both mentioned by JULIUS POLLUX (vii. 167 and x. 63) but without particular description. From a comparison of two passages in the *Equites*, 1087 and 1090, with a fragment of Athenæus, it appears these vessels were much alike, broader at bottom than at the top, and the ἀρίβαλλος the larger of the two. It is from this last vessel the sausage-seller sees in a vision the patron goddess of Athens casting tan-liquor upon Cleon.

From a passage in Athenæus, ii. p. 501, it seems that in the middle of the baths for the women, there was an ομφαλός, in the form, he says, of a hand-bowl, σκάβιον, which covered the waste pipe, and on which the women sat and chatted to each other.

An error has been committed as to the Πλύνος by some lexicographers: this is clearly the washing trough. HOMER gives it this name (*Iliad* xxii, 153) as the vessel by the side of the hot streams of Scamander, where the Trojan damsels washed their linen before the coming of the Greeks. And again (*Odyssey* vi, 86) as the vessels used by Nausicaa and her attendants when they go to the river side to wash their garments, which vessels, says the poet, were always (from year to year) left there, Εὐθ' ἤτοι πλυνοὶ ἦσαν ἐπηρετανοί.

Washing with nitre and soap is mentioned as early as Jeremiah (ii, 22;) and Susanna (*Apocrypha*, v, 17) is described as taking oil and washing-balls into the garden with her to bathe there. The Greeks used a quantity of these things, as enumerated by POLLUX (vii, 37, 38), the principal of which was κορία, lye, and a sort of fuller's-earth, κίμωνία γῆ; all these things were called ῥύμμα, and provided, some say, by the bath keeper. But the very passage cited seems to prove the contrary, for the woman in ARISTOPHANES (*Lysis*, 377) says, “If you happen to have the lye,” (εἰ ῥύμμα τυγχάνεις ἔχων,) “I will give you the bath.” The perspiration was scraped off by an instrument like a blunt knife, called a strigil, much as the ostlers scrape the sweat from horses with an iron hoop. XENOPHON (*Anab.* 1, 2, 10,) describes some of gold, which he calls στεργίλιον. After further rubbing with towels the bather was invariably anointed all over the body with scented oils.

Much stress has been laid on a passage in the *Odyssey* (xv, 135,) where Pisistratus and Telemachus are so splendidly entertained by Menelaus, to shew that in that day there were separate bath rooms, but the passage seems to suppose the direct contrary; in fact it is curious how such a mistake could have arisen, as the heroes do not seem to have moved from the hall or dining-room. The words are, “Then indeed they sat down on couches and seats, and a maid-servant bearing a basin (χέρυμβα) poured from a ewer (προχοή) “beautiful, golden, upon a silver λάβης, that they might wash,” she then places close to them “a smooth table,” and then she brings bread and all sorts of food. In the *Equites* (1055) the Sausage-seller tells the Demus that the baths (πνύλουν) in the bath house (βαλανείον) have been taken away, and the Demus cries out, “Then I shall go unwashed to-morrow.” It is clear in this case a separate word is used for the bath and the place which contains it. See also the ETYMOLOG. MAG. as before cited.

The origin of public baths among the Greeks is not clear, but it has been supposed with reason that private baths were first opened to friends at a small fee. That such existed is known from PLUTARCH (*Vita Demet. Poliorcet.*), where he

states that Democles, for a particular reason, would go to none but a private bath; this must have occurred about twenty years before Pyrrhus of Epirus invaded Italy. The success of the experiment among friends probably led to the establishment of public baths.

ATHENÆUS relates (viii, p. 351) that in the town of Phaselis, they were in the habit of charging foreigners double for a bath, and he relates a story of a bath-keeper, who when his attendant attempted to overcharge a stranger, cried out, “Scoundrel, would you make me a Phaselitan for a little farthing,” παρά χαλκόν μικρόν. In LUCIAN's time (Lexiphan.) the charge was but two oboli, and in the time of the Roman emperors, but a farthing, “quadrante lavari,” is mentioned both by Juvenal and Horace.

There is but very scanty information respecting the construction of the Greek baths; ATHENÆUS (lib. viii, 501), however, states that they were covered by a θόλος, or dome, and they were probably, in other respects, much the same as at Pompeii, one of those places which we know Juvenal denounces as a “græcam urbem”; in fact not only did the Roman fashion resemble the Greek, but it is extremely probable that the whole system of bathing among the ancients is yet kept up in all its stages to the present day in Constantinople. The East has long been remarkable for steady adherence to every old habit and custom; and it may now be worth while to enquire what was done in the Roman bath, and how far this is paralleled by the Turkish Hammâm.

Although there is such scanty material for an architectural description of the baths of the early Greek period, there are very minute and circumstantial descriptions of those of the later period, beginning with that of VITRUVIUS, and proceeding with those of SENECA and PLINY, to the time of LUCIAN, a range probably of 150 years.

The first-named author, lib. v, cap. 10 and 11, has given rules for the construction of public baths in the Roman way, and of palæstræ, xysti, and baths in the Greek way. PLINY the younger has given some account of his own baths in two of his letters (ii, 17, v, 6). SENECA (ep. 86) gives a very curious description of the old villa and bath of Scipio Africanus. LUCIAN, in a separate treatise, “Ἰσπῖαν ἢ βαλανείον,” describes some baths just erected by Hippias; these authorities are of course accessible to every one, and well known to the learned; so much only therefore will be extracted as will instruct without fatiguing the reader; the engineer's work will then be described, and it is proposed to conclude with a very brief account of the remains of some of these noble works of antiquity.

Following the description of Greek work it is thought preferable to take the 11th chapter of the 5th book of VITRUVIUS before the 10th. He commences by saying, he intends to explain the Greek edifices, although they are not in use in Italy. In palæstræ, he says, square or oblong peristyles (courts or cloisters) should be made in circuit the length of two stadia—each stadium is the eighth of a Roman mile, consequently the circuit would be 1,203 ft. 6 in. English, and the court about 300 ft. square. On three sides the colonnades are to be single; these, he says, the Greeks call εἰαντοί, but on the south side it is to be of double width with a double row of columns to keep out the dash, “aspergo,” of the rain in the windy season. In the three single colonnades are to be species of pavilions (hexædræ) with seats, where philosophers, orators, and others, may sit and dispute. On the side of the double colonnade, in the middle, is to be a very large hexædra for the young men to exercise in, with seats. It is to be one third longer than its breadth; on its right side a “coriceum.” (On this word there is much dispute, it will be treated of under its proper head, CORICEUM; it may suffice to express an opinion that it is a place for playing with the pilum, or ball sewed with leather. Under the strict seclusion the Greek women were kept, it is very unlikely the girls, κοῦραι, would be admitted in the very midst of the young men.) Next to this, the “conisterium,” or

place where the wrestlers were sprinkled with dust, that their adversary might not have a slippery hold. Next the "conisterium," in the turn of the colonnade "versurâ porticus," was the cold bath, which, says one author, the Greeks call λουτήριον: on the left of the ephebaeum (or young men's hexedra), the eliothesium, or anointing chamber of the young men, and next to that the cold eliothesium; from this passage we would suppose there was a difference between the ointments used after hot and cold bathing. From thence, one author says, there is a way into the propnigeum [literally choke-chamber] at the turn of the court; this was probably the stoker's. Much difference of opinion has been expressed as to this word; it is difficult to conceive why a hypocaust or præfurnium should be supposed to be more "choking" than the hot "laconicum," but on looking a little closer into Vitruvius and the meaning he gives his words, in the account of the water machine (lib. x, cap. 13), it will be found that he employs a sort of check valve, or damper, in the form of an inverted funnel, and calls it pnigeus. The ETYM. MAGNUM, *Edit. Princeps, sub voce*, gives this curious passage "πνιγνός, among the comic writers a furnace, and it is also part of an hydraulic machine, and signifies the bridle; it comes from πνιγω, the second aorist is πνιγου, from this is πνιγος, which signifies burning, or heat, and the word πνιγεύς, which signifies a baking pan, and also the bridle for beasts yoked to a carriage." It appears highly probable that the πνιγνός was the damper to the furnaces, to bridle or increase the draft. If this be correct, no doubt "propnigeum" was the stoker's. Next this, within the region of the frigidarium (not the frigida lavatio), is the concamerata sudatio, or vaulted sweating room; at one end of this is to be the laconicum, which will be treated of hereafter, opposite to this is the hot bath. Here is the sum of his description of the Greek ἑσπέρδιον.

The Roman baths are described in cap. x. VITRUVIUS directs first, choose a site as warm as possible, averse from the north and north-east, because the hot and tepid baths should have their light from the south-west (occidente hyberno: literally, "winter sunset"); if there are any difficulties as to the site, then from the south, as the time for bathing is from noon to evening. Then it is to be contrived that the hot baths of the men and women should be contiguous, that the hot water vessels should easily be used in common by both. Let there be three brazen vessels (our author directs) joined together (componenda), one hot, another tepid, and so placed that as much water shall flow from the tepid into the hot vessel, as hot water shall go out. The like from the cold to the tepid vessel. Let the vaults of the "alveoli" be heated from one common fire; as already intimated; [all this work will be treated upon hereafter.] Let the "suspensuræ" of the cells [hollow floors under which were the furnaces] be thus made: first, let the ground be paved with 18 in. tiles, laid with a fall to the furnace, so that a ball, if thrown in, should not be able to remain, but must run back to the stoke hole, and so that the flame may circulate better under the "suspensuræ;" let pieces of eight inch bricks (laterculis bessalibus) be built so that two feet tiles may be bedded on them. The height of the piers to be two feet, to be built with potter's clay (argilla) and hair, and the two-foot tiles bedded thereon, to carry the pavement. It would be better if the structure were arched, but if there be framed tie beams "CONTIGNATIONES" (which see; and also TRABS, TIGNUM, &c.) let "SIGNINUM OPUS" (flooring composed of a concrete, made of pounded tiles and lime, something like Messrs. Fox and Barrett's principle) be placed under. Let iron rods or bows (arcus) be made, let them be suspended to the trusses, by crooked irons, as closely as they can. Let the rods or bows be so disposed that the tiles can lie and be carried in pairs, and so the whole vaulting be perfect: let the upper part of this chamber be lined with lime and hair; the lower part, which looks to the pavement, to be first trowelled with baked clay and lime, and then let it be polished with fine stuff ("albario," lime without sand, see PHILANDER in loco) or stucco ("tectorio," lime

with sand). These chambers in the hot baths, if made double, will be the more useful, as the damp of the vapour will not injure the material of the roofing "contignatio," but will pass off between the two chambers.

"The sizes of the baths must be according to the number of bathers. Let them be thus made: the width the same as the length, less one third, exclusive of the 'schola of the labrum' (bath) and of the alveus. The labrum bath should be constructed under a light (window) so that those who stand round should not darken the light by their shadows. It is necessary that the whole of the baths should be spacious, as when the first shall have taken their places, the others looking on should stand properly. The alvei should not be less than six feet wide between the wall and the pluteus, so that the lower step and the seat (pulvinus) should take off thence two feet."

It will be better now to pause and examine this passage.



That "labrum" is the bath, the πύλος of the age of Aristophanes, has already been explained, and of which there is no sort of doubt. The alveus has generally been considered to be the hollow part of the bath itself; but there seems this difficulty, if a seat and step of two feet are to be taken off six feet, the bath could only be four feet long, and could never have held nine persons at once, as shown in Fig. 1, given by MERCURIALI, *de Re Gymnas. apud Polen*.

Alveus has a great number of significations; from its primary meaning, the belly, it seems to have expressed any long flat hollow vessel—a trough or a tray, a back-gammon board (*duodecim scripta*) the hold of a ship, any trough-like hollow utensil or vessel.

The section of the bath at Pompeii, as given by SIR WM. GELL, is shewn Fig. 1, Plate II. Former writers, and even some later ones, have suggested A as the alveus; while MARINI and those who have followed him consider A to be the labrum, B the upper seat or spaces called scholæ (at Pompeii in the piscina are niches in the scholæ), C the pluteus, and D the solium, or inner seat. Now the labrum, marked E, Fig. 1, seems to have been a large laver, or πύλος, as shown also in Fig. 2, from the baths of Titus; and there seems no reason why the rim of the bath should be called a wall "pluteus." It is not necessary to pursue this criticism further, but to suggest that PLINY, Ep. IV. 6, calls the bath "puteus": if pluteus be considered therefore to be an error of the transcriber for the former word, the meaning of alveus is plain—it is the passage between the wall and the bath. This emendation, however, is thrown out with considerable diffidence.

The description of Vitruvius finishes thus: "Let the laconicum and sweating-baths be joined to the warm-bath, these should be as broad as they are high (measuring) to the lowest curvature (springing) of the hemisphere; let a light be left in the middle of the hemisphere, from which let a brazen shield hang by chains, by whose rise and lowering, the temperature of the sweating may be regulated. It should be made circular (*ad circinum*), that the force of the flame and vapour should pervade equally from the middle by the roundness of the curvature."

These descriptions are given at greater length as the work of the great architect of antiquity: the others will be merely glanced at; that of PLINY (*Epist. lib. v. 6.*) gives a picturesque account of his Tuscan villa, at the foot of the Appenines: of course his bath was private. After describing the different parts of the house, he says: "There is then the winter cubicu-

lum extremely warm, as it is filled with the full sun; attached is the hypocaust, and if the day be cloudy, its emitted vapour supplies the place of the sun. Then the apodyterium receives in its cold cell him relaxed and joyous from the bath. In this is a plunging bath (baptisterium) wide and deep. If you wish to swim at more ease and in warmer water, in the area there is a piscina, and in the next a puteus, if you would again be cleansed (abstergi may be read, rather than astringi) if you dislike the weather. He then states there are "cellæ frigidariæ," cold rooms, a "spheristerium," or tennis-court over the apodyterium, and then he proceeds with an account of the rest of the villa. A description of his other villa at Laurentinum is given, lib. ii, 17. In the midst of the minute details of this villa is the mention of "cold-baths broad and spacious, on the opposite sides of which are two plunging-baths (baptisteria) in which you may swim if you wish. Next to this the anointing-room, and the hypocaust, and next to the bath the stokery (propnigeon) then a warm-bath, whence the swimmer may look on the sea. Next to this the tennis-court," etc. etc.

A most delightful description is given by SENECA, *Ep.* 86, of his visit to the bath of Scipio Africanus: he contrasts the little plain building belonging to the great hero with the luxurious baths of his day. The letter throws little light on the architecture. The mention of columns and statues would not be unexpected, but our readers will be surprised however to hear of inlaid gems, glass windows, and silver bath-cocks (epistomia) as early as about A.D. 50. The letter will amply repay a perusal, but is too long for these pages.

The description of the baths erected by Hippas, must not however be passed over quite so lightly. It is given by LUCIAN in a tract under that head. He commences by stating how few men there are, and how much they are to be commended, who shine in more than one art or science, and then praises Hippas as one who was at once celebrated as an orator, writer, mathematician, mechanic, musician, and architect. He then enters upon a long relation of the baths erected by him. After describing the difficulties of site and foundation, he says, "a large common hall (αἶθρος) receives those who enter, fit for the footmen and servants to wait in; on the left are chambers fitted up for lounging (ἐν τρυφῇ). These, he says, are excellently fitted up with plenty of light near the baths, and suitable for the genteler (ευταμονεστέρων) people [in fact first-class waiting-rooms]. After these, and beneath, are sufficient receptacles for taking off clothes, διαρκεῖς τοῖς ἀποδυομένοις ἀποθέσεις (dressing boxes). A middle hall of great height, superbly lighted, holds three swimming-baths (κολυμβήθρας) of cold water, adorned with Læcian marble. In this are two antique statues of white marble—Health and Esculapius. Entering thence, a hall, gradually warmer, receives you with a not unpleasant heat, of long form, and arched throughout. Then, on the right, is a hall containing every variety of ointments, having entrances below ornamented with Phrygian marble leading to the palaestra. Then another hall, the most elegant of all, fitted to stand or sit in, to wait a long time or to 'roll oneself about in' (ἐγκυλισσάσθαι) of polished Phrygian marble to the very top.

"Within is the hot-bath (θερμόν) of Nomad-stone. Inside of which is a beautiful hall, full of light, and as it were flowered with purple. In this are three hot-baths (πυλωναί).

"There is no need to return by the other halls, but directly by the cold room (or bath) ψυχρόν, through the gently warm (tepid) bath (ἡρόμα θερμῶν)—LUCIAN then goes on to describe, in general terms, the light and beautiful appearance of the building, but on this and his conclusion there is no occasion to dwell.

Some readers might think an apology necessary before the next and last classic authority is introduced. It is from the *Oneirocritica* of ARTEMIDORUS, of Daldis—the Dream-book of the ancients. No Seven Dials catch-penny, with a gaudy frontispiece, portraying a gentleman in an intensely blue coat, and a lady in all the colours of the rainbow, extending

their palms to an old woman in a red cloak, but a grave serious quarto, in very good Greek, of the age of the Antonines. The passage is, however, very curious, and as it is doubted that it has ever been submitted to the English reader, a portion is here abstracted. "To dream," says the author, "of bathing was formerly not considered to be bad—for they knew nothing of baths, but they washed in ἀσπιδόθους. In later times it was judged bad to dream of baths, even of seeing them; for men generally bathe after labour, and especially after returning from the wars. But now-a-days the bath is nothing but the introduction to good cheer—ἡ δὲ ἐπὶ τρυφῇ—and therefore to dream of beautiful and clear baths, and genial warmth, is a sign of wealth and prosperity, it also signifies health to the rich. To dream of bathing in an unusual manner is bad, as to dream of entering the θερμαί with one's clothes on." He then relates a story of a lute player, who was hissed off the stage after dreaming he was in a bath without water. "It is good," he says, "to dream of bathing in rivers and pure springs, but not to swim—this signifies danger and disease. To dream of the strigils and instruments for cleansing the skin (στεργίδες τὰ ἔξωται καὶ καταμάχαιρα) signifies servants. He who dreams of losing his strigil will lose a slave." This might be interesting on the other side of the Atlantic. "The oil-flask (ἀγκυθός) and the strigil-case (ἐνστροφάλις)," he says, "signify your wife's slave, or a faithful maid-servant."

It appears from the foregoing that in the later times, there were two sorts of bathing, the cold and the warm. This treatise, of course, is of baths, rather than bathing, and it is desirable to describe no more of one than will illustrate the other, and make the treatise intelligible.

The parts of the cold baths seem simply to have been, first, the apodyteria, or dressing rooms. It is singular that VITRUVIUS, with all his minuteness, does not mention this; while LUCIAN calls them ἀποθέσεις, or in common English, drawers, boxes, or literally, "put-away" places. It is possible they were not rooms, but enclosures, like our dressing boxes. At Pompeii, the frigidarium seems to have served as the apodyterium. The clothes were taken, some authors say, by servants, called "capsarii," because they put them in "capsæ" (see the *Digest*, i, 15, 8, where the theft of clothes is made a capital crime); others call them "caprarii," because the garments were hung up on hooks of horn. That this seems an invariable practice we learn from Cicero's speech in defence of M. Cælius Rufus, charged by the notorious Clodia Quadrantaria (the Lucretia Borgia of the day) with an attempt at poison. The drug, this female Titus Oates swore, was to have been conveyed in a box by a young man named Licinius, and given to Cælius in the bath. Cicero shows how unlikely and improbable a story this is, as there was no means of concealment of a box when the parties were undressed, and that if "shod" and dressed "calceati et vestiti," they would not have been admitted. That the dresses were left in the same way on the woman's side is learnt from OVID (*de Arte Amand.* iii, 639).

Next was the plunging, or swimming bath, called λουτήριον, κολυμβήθρα, βαπτιστήριον, piscina, puteus, natatio, natatorium, &c. At Pompeii this is circular, about 13 feet in diameter and 3 feet deep, with scholæ or vacant spaces, and niches round it. That the Romans used to swim in these, there is the often cited observation of Cicero to his brother Quintus, where he wishes for a wider piscina that he might not hurt his hands when he flings them out. After this, it is surmised, came the cold anointing chamber, the "eleothesium frigidarium" of VITRUVIUS, and this seems to have completed the cold bathing. They who used the hot baths also commenced by undressing, either in the apodyterium or the frigidarium.

It is not desirable to enter into the different methods of bathing as recommended by the two great doctors of antiquity, Galen and Celsus; suffice it to say, like other doctors, they differ: the first recommends, to commence with the hot air of the laconicum, then the warm bath, then the cold; while the latter recommends, first, the tepidarium, then the caldarium (which in-

cludes the laconicum), then the frigidarium. While in the laconicum, the perspiration was scraped off by the strigil, and a sort of shampooing took place. The anointing is beside the present purpose; those who wish to know more of the unguents of the ancients, should consult that wonderful and amusing collection of all the scraps and *omnium-gatherum* of antiquity, the *Deipnosophists* of *ATHENÆUS*.

Perhaps most light will be thrown on the subject by a comparison with the modern Turkish bath. As it will be necessary to make some allusion to these before the conclusion of this treatise, the highly graphic description of the celebrated Mr. Michael Angelo Titmarsh is at once extracted. This ingenious gentleman writes from Constantinople, thus:—

"I made the dragoman conduct me to one of the best appointed hammams in the neighbourhood, and we walked to a house at Tophana, and into a spacious hall lighted from above, and which is the cooling room of the bath [the frigidarium of *VITRUVIUS*]. This spacious hall [the *οίκος* of *LUCIAN*] has a large fountain in the midst, a painted gallery running round it, and many ropes stretched from one gallery to another, with profuse draperies of towels, and blue cloths for the use of the frequenters of the baths. All round the room and the galleries were matted enclosures, fitted with numerous neat beds and cushions for reposing on, where lay a dozen of true believers smoking or sleeping, or in the happy dozing state. I was led up to one of these beds to rather a retired corner, in consideration of my modesty; and to the next bed presently came a dancing dervish, who forthwith began to prepare for the bath.

"When the dancing dervish had taken off his yellow sugar-loaf cap, his gown, shawl, &c., he was arrayed in two large blue cloths [probably *περικυματα*] a white one being thrown over his shoulders, and another, in the shape of a turban, plaited neatly round his head. The garments of which he divested himself were folded up in another linen and neatly put by. I beg leave to state I was treated in precisely the same manner as the dancing dervish. [If the *αποδυτήρια* be considered to be the same as the *αποδυτήριον* of *LUCIAN*, the above is an exact description of the ancient bath; if the apodyterium was a separate hall or room, it would certainly have been so described by *Vitruvius*].

"The reverend gentleman then put on a pair of wooden pattens [soleæ; *SPARTIANUS* calls one of the chambers in the baths of Caracalla, 'cella solaris'] which elevated him about six inches from the ground, and walked down stairs and paddled across the moist marble floor of the hall, and in at a little door, by the which also Titmarsh entered. But I had none of the professional agility of the dancing dervish; I staggered about very ludicrously upon the high wooden pattens, and should have been down on my nose several times, had not the dragoman and the master of the baths supported me down the stairs and across the hall. Dressed in three large cotton napkins, with a white turban round my head, I thought of Pall Mall, with a sort of despair. I passed the little door; it was closed behind me; I was in the dark; I couldn't speak the language; in a white turban, mon Dieu! what was going to happen.

"The dark room was the tepidarium, a moist, dark, oozing, arched den, with a light faintly streaming from an orifice in the domed ceiling—

"When you get into the sudarium, or hot room [the laconicum and caldarium], your first sensations occur about half a minute after entrance, when you feel that you are choking [see the description of this apartment by *LUCIAN*, in the *Hippias*, given above]. I found myself in that state, seated on a marble slab; the bath man was gone; he had taken away the cotton turban, and shoulder shawl; I saw I was in a narrow room of marble with a vaulted roof, and a fountain of warm and cold water: the atmosphere was in a steam, the choking sensation went off, and I felt a sort of pleasure presently in a soft boiling simmer, which, no doubt, potatoes feel when they are steaming.

You are left in this state about ten minutes; it is warm, certainly, but odd and pleasant, and disposes the mind to reverie.

"But let any delicate mind in Baker-street fancy my horror, when, on looking up out of this reverie, I saw a great brown wretch extended before me, only half dressed, standing on pattens, and, exaggerated by them and the steam until he looked like an ogre, grinning in the most horrible way, and waving his arm, on which was a horse-hair glove—

"The grinning man belabours the patient violently with the horse brush. When he has completed the horse-hair part, and you lie expiring under a squirting fountain of warm water, and fancying all is done, he re-appears with a large brass basin, containing a quantity of lather, in the midst of which is something like old Miss Mac-Whirter's wig, that she is so proud of, and that we have all laughed at. Just as you are going to remonstrate, the thing like the wig is dashed into your face and eyes, covered with soap, and for five minutes you are drowned in lather; you can't see, the suds are frothing over your eyeballs; you can't hear, the soap is whizzing in your ears; you can't gasp for breath, Miss Mac-Whirter's wig is down your throat, with half a pailful of suds, in an instant you are all soap; wicked children in former days have jeered you, exclaiming, 'How are you off for soap?' You little knew what saponacity was till you entered a Turkish bath—[The same operation is described by Savary, one of Bonaparte's savans in Egypt; curiously enough, he says, they called the soap *rusma*, evidently a corruption of *ρῆμα*, of which mention was made before].

"When the whole operation is concluded, you are led—with what heartfelt joy I need not say—softly back to the cooling-room [this explains the use and name of the *ψυχρον*, or frigidarium], having been robed in shawls and turbans as before. You are laid gently on the reposing bed; a cool sweet dreamy languor takes possession of the purified frame, and half an hour of such delicious laziness is spent, as is unknown in Europe."

There is no apology needed for quoting at such length this brilliant little description, feeling that it illustrates the subject both of ancient and modern baths so well, and besides (a thing it is hoped ever before one's eyes) it saves space, and the reader's patience.

It is now proposed to turn to what in these times is called the *engineering department*. Like everything else the Romans did, this was carried out in a far more vast and striking manner than would be at first supposed. It is now found difficult, even with best Low-moor plate boilers, and all the appliances of modern science, to keep baths going for one hundred persons. Conceive then what it must have been in the baths of Diocletian, where 1,800 persons were accommodated at once. Let the mind be made up to listen to something out of the way, and be told that all this mass of water was boiled in brick chambers, put together with lime and hair, and lined with tiles bedded in the same; that there are the remains of a set of these chambers, twenty-eight in number, below (or as a ground story), covered with twenty-eight other chambers as a sort of first story, and containing two millions and a quarter cubic feet, or nearly fourteen million gallons, all heated by one furnace forming a basement; that such a building would actually cover more ground than Exeter Cathedral, and would hold as much water as that entire building, transepts included, if filled to within nine feet of the ridge rib of the groining, and that this mass of water was boiled without apparent difficulty; an idea of the *Castella* of Antoninus can then be imagined, and also some faint idea formed of Roman engineering. What are the dye or print works of the present age to this? The boiler power at the largest foundries or factories, is a plaything to it. This interesting subject will be now entered into at more length.

The furnaces have been carefully described in the above cited passage from *VITRUVIUS*, and seem to have been constructed so as to be best adapted for burning wood. The ash is a simple alkaline powder (the *καπνία* of the Greeks, of immense

value to the ancients, as the method of separating soda or potash from chlorine was unknown), a powder which could easily be swept away by a broom, unlike the soot from coals: no fire bars, or bridges were wanting; a simple paved floor with a slight incline to give a draught, was all that was necessary. In fact it was like the bottom of a country oven. But, how simple piers of brick in pottery clay and hair, and simple tiles, and a sort of trowelled concrete floor on this, could bear at once the vast heat of the fire, a weight of water of many tons to the foot, and the expansive power of the boiling fluid, besides the wear and tear of constant flame, is wonderful indeed. However, there are the Roman hypocausts to this day, and the united labours of PIRANESI, and of CAMERON (*Baths of the Ancients*, fol. London, 1772), have proved to demonstration this is no fable.

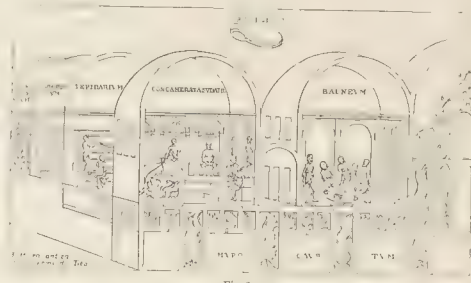
Of course these are the suspensuræ of VITRUVIUS. At Pompeii, instead of 8 in. square piers 2 ft. high, they are 9 in. square and only 1 ft. 7 in. high. They support strong tiles 15 in. square, on these is the *signinum opus*, or Fox and Barrett concrete, and then where they are visible, as in the laconicum, a mosaic pavement is bedded upon it. Every wall and every pavement was perforated by square earthen tubes, Plate II, Fig. 5, fitting into each other, through which the flame and smoke circulated and afforded as much heated surface as possible. See also the detail from the Baths at Augusta Rauracorum, Fig. 1, Plate III. The invention of the suspensuræ has been attributed to the Sybarites; be that as it may, it was evidently new in the time of SENECA. That author (Ep. 90) speaks with wonder of the things discovered in his memory, as window panes made of talc; the *suspensuræ* of the baths; and "tubes impressed within the walls", through which heat might circulate equally above and below; contrivances to cut and polish marble, and to erect porticoes and arches; and lastly, the invention of marks for words, "by which an uttered speech might be seized, and the hand follow the celerity of the tongue." If the good philosopher marvelled so at short hand, what would he have thought of the electric telegraph?

The English antiquary must beware of an error into which too many persons have fallen, namely, that of calling every Roman remain a *Bath*, where a hypocaust has been discovered. Most of those found in this country were intended to warm the dwelling rooms, and supply the want of an Italian climate in houses which strictly followed the Roman model. The small "foculus" or brazier, with which the Romans were accustomed to ward off the little winter they got in their own climate, would have been useless in the rigorous winters of a wooded country, where every stream was ice-locked during the winter months. Fancy the looks of some gay-plumed young Centurion, accustomed to lounge along the Via Sacra, or complaining of the horrid algid cold as soon as a little snow fell on the extreme top of Soracte, when his face had to encounter the north-east winds of the hills of Yorkshire—or still worse of the Grampians. No wonder they gladly resorted to the invention of the Sybarites, and that almost every Roman building in England has its hypocaust, in some form or other.

The laconicum seems to have had the usual hypocaust under the floor, and a false lining round the whole room, behind which the heat circulated, like the gallery flues of a boiler. This false lining was formed in a very curious way, of large square tiles, fixed by metal cramps at each corner. It appears that while the tiles were moist, a sort of plug was thrust through in several places, forcing out the clay like a tube, and forming a kind of short pipe on the back of the tile. Through these the cramps passed, and of course the length of the tube regulated the distance from the wall, and the space for the heat to circulate in. A quantity of pitch was found in the stokeries at Pompeii; whether intended to light the fires, or to give an occasional extra impetus to the flame, is not known.

Now that the laconicum is being treated of, it is preferable to revert to the description of the clypeus or shield, as given by VITRUVIUS. Much conjecture has been bestowed on this sub-

ject, but it seems clear enough. Besides the heat of the hypocaust, a painting in the baths of Titus (Fig. 2), shows that a fire was actually kindled in the laconicum. This seems to have



been enclosed in some hemispherical metal vessel. Within this is drawn a second, suspended from the first by chains, exactly as described by VITRUVIUS, and it is easy to see how this second vessel (marked clypeus) could be raised or lowered, and would act as a sort of damper, extinguisher, or large curfew (*couvre-feu*) on the fire. Probably water was sprinkled on the outer metal vessel to temper the dry heat of the place. Far be it that these individual remarks should be placed against those of more learned authorities, but there is such strong professional bias in favour of a drawing or a diagram, and the matter seems such common sense, that the wonder is, there has been so much discussion about it.

Let the subject of heating the water be now returned to; again reverting to the description of VITRUVIUS (*vide supra*). He distinctly describes three vessels joined (*componenda*) in some way, one boiling, one tepid, and one cold, and so placed in conjunction (*collocanda*) that as much water should flow from the tepid into the boiling vessel as should be drawn out, and the like from the cold into the tepid. An infinity of labour has been bestowed on this passage, some critics have placed these coppers (*ænea*) side by side, and supposed that one filled the other by a syphon, some have drawn them as a little above each other, and the water running in an ordinary way from service cocks. Others have placed them one on the top of the other, almost like the old chemical Nouth's apparatus. The second is the way in which they are drawn in the picture, found in the baths of Titus (Fig. 2), and which being a clear diagram ought to have every consideration. But there is this practical dilemma,—if the water passed from one vessel into the other by mere service cocks, how could the middle vessel become tepid? There must have been a connection between it and the boiling vessels, or no heat whatever could pass, and if there was a connection so that the hot water could circulate, the hotter fluid would naturally rise, the highest vessel would contain the boiling water instead of the lowest, and the lowest would be the tepid vessel. With a rapid circulation it might become something more, but certainly could not be the hottest.

If the section of the castella, as given by PIRANESI (Plate II, Fig. 2 and 3), be referred to, A will be found to be the main service of water from the great aqueduct; B, a sort of cistern or filter, with probably a grating to catch leaves, etc.; D, a huge open shallow cistern wherein the water was exposed to the sun, and partly heated thereby: this was the roof or top of the upper set of twenty-eight chambers described before, each chamber being 49 ft. 6 in. by 27 ft. 6 in. and 30 ft. high, all vaulted over, and lined with tiles and *opus signinum*; F, the hypocaust; G, the furnace mouths; H, the upper set of chambers; I, the lower set. Fig. 5 shows the pipes, the *tubi impressi*, in the walls; and Fig. 4, the *suspensuræ*, all of which have been before described. Now it is clear that D represents the *æneum frigidum* of VITRUVIUS, H, the tepid vessel, and I, the boiling vessel. There are many ways in which the supply from one to the other could be regulated. The simplest would be a clack-valve, and a balanced

float. It is not known whether the Romans were acquainted with the ball-cock, but as they knew the bibb-cock or epistomium, this could easily be imagined. Now, as before stated, if there was a constant communication between the two chambers, a circulation would take place and both would boil. The difficulty appears to be easiest explained thus: whatever was the position of the vessels, the steam only, generated by the boiling vessel, was conveyed into the second vessel, and became gradually condensed there by the cold water, just as when a locomotive stands still, the driver turns his waste steam into the water tank, and gets it partially hot, so that steam may be more quickly generated in the tubes, than it would be, were quite cold water injected into them.

A series of plans will be now described of existing Roman baths, beginning at the smallest known example, and proceeding to the magnificent erections of the emperors.

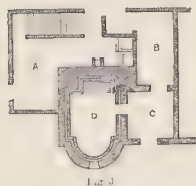


Fig. 3 is from a villa on the supposed site of the ancient Stabia, a little beyond Pompeii. A, the præfurnium or stoker; B, the frigidarium; C, the tepidarium; and D, the laconicum, with its double walls.

Fig. 4 is from the same neighbourhood, but of larger size. A, the præfurnium; B, the frigidarium; C, the tepidarium, of much greater extent; D, the laconicum, of exactly the same plan as the last; but in addition to these, there is E, the piscina, or cold swimming bath: it has niches, or scholæ, like that of the large baths at Pompeii (Plate I, Fig. 2, c); F, part of the atrium of the villa, or colonnade leading to the baths.



The pile of buildings forming the example of baths from Pompeii (Plate I, Fig. 2), fills up the whole space between four avenues, and forms an entire insula, as was usual, and is now so in Italy. The lower portion of the frontage, and perhaps a small mezzanine or room over, were let off as shops. At A, the water service entered, coming from a piscina or cistern, at the other side of the street. 1 appears to have been the stoker; 2, the furnaces themselves; 3, the court for stowing fuel, and for the general use of the engineer; here, as was said before, a quantity of pitch was found; the stairs shown, led, some up to the boiling vessels, others down to the furnaces. The men's baths had three entrances, 4, 5, and 6; the principal was the latter, and led to the waiting-room 7, passing through the open court or atrium 8; the entrance 5 also led to the same court. 7 was surrounded by seats, probably for the servants in waiting, and in it was found the box of the money-taker, and a sword, probably also belonging to this functionary. Passing through the different corridors, as the entrances directed, the bather came to the apodyterium or dressing-room, B. In the corridor marked 4, no less than 500 lamps were found—for what purpose placed there it is impossible to say—the ceiling was decorated with stars, like some gothic chancels. The apodyterium had seats of lava, with foot-stools, and the holes where the pegs were fixed, on which the dresses hung, are plainly visible. A small closet, 9, probably contained the valuables left by the bathers. This room, SIR W. GELL, with great probability, supposed to have been not only the apodyterium, but the frigidarium or cooling-room. This is the more probable, as it leads into the other rooms, just as in the smaller instances. C was no doubt the piscina, frigida natatio, or plunge bath; the niches round were no doubt the scholæ. The bath is 12ft. 10in. in diameter, and 2ft. 9in. deep, entirely of white marble; the supply was a bronze mouth, and at bottom was a small waste to cleanse it out, an overflow waste was placed at the edge. D is the tepidarium, a very handsome vaulted chamber, enriched

throughout; the springing of the arch of the ceiling being supported by Telamones, or powerful human figures. In this room were some seats, and a brazier of bronze, showing, that in very cold weather some additional heat was required to render the temperature tolerable. E was the caldarium, containing at one end, as has been shown by the large section (Plate II, Fig. 1), the labrum, and at the other the alveus, puteus, etc. This has already been so fully described that it need not be repeated.

The entrance to the women's baths seems to have been at 10. F appears to have served both as apodyterium and frigidarium: it contains a cold bath, and also accommodation for ten persons to dress or undress. G appears to have been their tepidarium; it is a room about 20ft. square; while H is the caldarium, containing the labrum and a hot bath, 11, close to the furnace like those of the men. The women's baths have suffered much more from the hand of time than those of the men. It would not have served any purpose to enter into the details of the architectural decoration, but only to convey such general ideas of the plans as would illustrate the previous descriptions.

The ground plan of the splendid baths of Diocletian (Plate I, Fig. 1), like all these later edifices, comprehended not only baths, as described by VIRUVIUS, but palæstræ, hexedre, a stadium, libraries, and even a theatre. This illustration is given as one of the best arranged plans of the kind. The main buildings are situate in the midst of a quadrangle. A, entrance hall (stated by CAMERON, but he does not say on what authority, to be the bath-room of the athlete); B, the waiting-room, undressing-room or apodyterium; C, the xystus, with margins, that the bystanders might witness the games, and yet be out of the way; D, a large atrium, with a piscina, or swimming-bath in the centre; EE, vestibules leading into FF, tablinæ, and thence into GG, the cold baths, frigida lavatio; HH, the conisterium, or place for anointing and sprinkling with sand; II, ephæbæum, or place for exercise for the younger men; KK, elæothesium; LL, frigidarium; MM, tepidarium; NN, caldarium; OO, laconicum; PP, detached circular buildings, supposed to have been small temples; QQ, libraries; RR, atria ditto; SS, back entrances, probably to the theatre; TT, rooms attached to the xystus; UU, rooms said to be intended for the athlete; WW, two peristyles with swimming-baths in the centre; XX, YY, ZZ, detached baths, apodyteria, and elæothesia, said to be for the use of the philosophers, or for other distinguished persons; AA, bath keeper's apartments; BB, schools; CC, the stadium; DD, the theatre, i.e. the spaces for steps to the seats.

With the advance of Christianity the system of public baths seems to have declined; some have supposed it to be intended to mark the difference between Pagan luxury and Christian simplicity: this can scarcely be agreed to; but it is no doubt true that during the entire mediæval period there is no record of anything like large public bathing establishments in Europe. That bathing, however, was extensively used, and its practice peculiarly respected, is found from numberless instances. The strongest perhaps is the circumstance of the ceremonial of bathing previous to conferring the order of knighthood on those who, during the middle ages, had merited this honoured distinction. The great SELDEN himself, in his *Titles of Honour*, has not been able to unravel the mystery: certain however it is, that the order of the Bath is the second among the exalted ranks of knighthood in our own land. A foreign writer has fancied that the lavatorium attached to monastic buildings had something to do with bathing, but an inspection of the existing cloister would show it was a mere place for washing hands.

The Russians have now, and have had for centuries, a species of laconicum or sweating bath, the heat being produced by scattering water on red hot stones; but as these buildings are mere wooden sheds, it would be useless for the object of the present purpose to dwell on them. The Indians of America have similar baths constructed of wicker and covered with skins. In these they make a sort of sweating bath, not unlike the description given by HERODOTUS of those of the Scythians, with

which nation the North American Indians have many points in common.

There are many public baths in Europe, and some of them splendid buildings; but as bathing seems the last thing thought of by the proprietors, and as the magnificent edifices at Wiesbaden and Carlsruhe, at Bath and Cheltenham, seem decidedly planned for music and promenades, and in some instances even as salons for gamblers, they are also as much beside the purpose as the rude examples above quoted.

The only modern instances of public buildings purely devoted to these purposes are the hammams of the Orientals. Their similarity to those of the Romans has been already dwelt upon, and much more cannot be added to the graphic description before cited of Mr. M. A. Titmarsh. A plan and section (Plate II, Figs. 6 and 7) is given of one, from the celebrated architect Ramée. A, the divan, waiting-room, or frigidarium, and sometimes serving also as the apodyterium, or dressing-room; B, the tepidarium, or first warm chamber; C, the caldarium, or sweating chamber; and D, the place in which the bather gets the thorough ablution of soap as before described; this room probably answers to the labrum of the ancients. These buildings have another point in common with those of Rome. The bath-rooms are almost invariably vaulted or domed; the light descends by small polygonal apertures, and produces the most singular and picturesque effects as it breaks through the volumes of rising steam upon the scene below, and tinges the shaven crowns and bushy beards of the believers in Mahomet. Figs. 2 and 3, Plate III, are a plan and section, being an interesting example of a double bath for men and women.

There is but little reason to doubt that the cause of the disuse of public baths for long years back has been just the reason why they are now re-established. The question turns wholly on the density or scantiness of the population. Devastated as all Europe was after the inroads of the northern nations, few and scattered as was their population, the necessity for such establishments did not exist. The bather could without difficulty resort to the clear pool or bright river, and as it is in crowded assemblies the need of artificial ventilation is felt, so it is in an increasing population the need of readier methods of purification must be resorted to. And this commences the second portion of the task here undertaken.

BATHS (MODERN) AND WASHHOUSES.

Requirements arising in society very slowly and gradually, and which do not depend on any great fact or marked event, are always the most difficult to understand and the latest to find a cure.

As society is now constituted, it is too often the case that evils of this description are first detected by the eye of some pretender, who has a nostrum to propound for every disorder, who exaggerates every evil for the purpose of exalting his own self and his own remedies. The frequent repetition of this system has caused the public to be cautious in listening to complaint, and suspicious of receiving remedial suggestions.

The charlatan is without doubt one of the greatest causes of "obstruction", as it has been called, in the present day, and perhaps in no instance is this more signally evident than in all matters which the vast increase of our population has affected.

Day by day, the tide of population has rolled onwards. Day by day, for years, there has been a steady increase, in a steadily increasing ratio. From 1650 to 1770, our population doubled; it has since doubled again! Four persons now feed where one fed, four persons reside in the same town where one formerly did. Four persons demand air, water, cleanliness, moral opportunity, and moral checks, where one formerly required them. The change in habits, the crowding together of the population, the struggle to get four times the water from the same fount, the difficulty to maintain air fit to breathe, when four times the number are huddled together where formerly one respired

freely,—these are all evils that have gradually made their way, and necessitate the formation of establishments contrived to supply the increased sanitary requirements.

Of all the expedients for the health and comfort of the inhabitants of towns and populous places, that have been devised of late years, none has been more successful than the institution of baths and wash-houses. It has already done much, though in its infancy, and promises to do much more. It is hardly true that we are not a bathing nation, and do not understand the comforts of a complete ablution. Every one will remember that at one time every school-boy learned to swim, and throughout the summer months, wherever there was a river, or a clear sheet of water, it was an eager resort for hundreds of active bathers. In almost every gentleman's garden, where clear water could be got, there was the little bath room, with its quaint Dutch tiles, and little lantern-light, filled with pale stained glass. But now, when every river is polluted by the sewers, when a spreading population has rendered it impossible to bathe in open streams with common decency, when the supply to every bath and closet is gauged by the eager eye of the company's official, and charged at a rate that formerly would have paid the ground rent of the house, it behoves us to have resort to other means, and to supply, by the aid of science, that which circumstances beyond our control have deprived us of.

Again, in open towns, when every house had its garden, and the chimneys were so few that the dreaded enemy of the housewife, "the blacks", did not undo her work,—when, in case of rain, there were out-buildings in which the reeking linen might be suspended, and so the domestic hearth kept free, the necessity for the artificial system of washhouses was not felt; but, when dwellings are crowded close together,—when gardens and yards are swallowed up by bricks and mortar,—when chimneys are multiplied, and out-buildings become rare and dear,—when water is scarce, and fuel expensive,—then is the value of this system felt and acknowledged.

Like most salutary institutions, it has been of slow growth. It originated at Liverpool, as long back as the year 1832, when first it was proved that the best check to cholera was cleanliness. In one of the poorer parts of the town, the wife of a labourer rented a small out-house, in which she had the wealth, not

"Ex ære lobetas

Cymbiaque argento perfecta, atque aspera signis",—

but a common washing copper. By the kind subscription of some ladies, aided by the weekly contribution of the mighty sum of a penny from themselves, the neighbours were supplied with hot water. An ingenious network of cords was stretched from back window to back window, and by these humble means, directed and assisted by the kindness of these ladies, no less than eighty-five families per week were relieved from the nuisance and unhealthiness of washing in their own crowded apartments. This suggested the idea of building a set of common washhouses, and uniting the advantages of bathing to them; and in May 1842, the first regular establishment was opened at Liverpool. It succeeded so well, that it was soon followed by one of six times the size, the continued success of which was so great, that public attention was called to the subject throughout the country. It was not, however, till October 1844, that a public meeting was held at the Mansion House on the subject, and strenuous efforts made to erect an establishment in the metropolis. So great, however, were the difficulties, that it was not till November 1845, that possession was obtained of the ground, and the first stone laid in December of that year. Difficulties, delay, and expense of every kind, seemed flung in the way of the enterprise, and one-half the establishment only could be opened by July 1847; in the meantime, the committee had, with great exertions, obtained an act of parliament to encourage the establishment of public baths and washhouses. It is unnecessary to relate the history of the struggle, or to state any of the arguments used against the system.

So entirely different, however, have been the results from

what was generally anticipated, that instead of thrusting the buildings out of sight in any hole or corner, it was found desirable to place them in the most conspicuous spot, and to make them not only valuable, but ornamental structures.

The bill, which received the Royal assent on the 26th August, 1846, is headed the 9th and 10th Victoria, chapter 84, and is intitled "An Act to encourage the establishment of Public Baths and Washhouses". Of the provisions, the following are those which bear more immediately upon the present purpose:—Sections 3 and 4 enact, that the council of any borough may, if they think fit, adopt the act absolutely; and that the expense of carrying the same into execution shall be charged upon the borough fund, and the income arising be carried to the same; and that a separate account shall be kept, called the "Public Baths and Washhouses Account".

Sections 5 and 6 enact that, on the requisition of ten rate-payers, the churchwardens of any *parish* may convene a meeting of the vestry, giving seven days' notice; and if it be resolved by such vestry that the Act be adopted, a copy of such resolution shall be sent for approval to the Secretary of State, but no resolution shall be deemed to be carried unless two-thirds of the votes be in favour of the same; and that not less than three persons, nor more than seven, be appointed Commissioners for carrying the same into execution.

Sections 24, 25, 26, and 27 give Commissioners power to appropriate borough lands, or parish lands, as the case may be; or, if not, to purchase or rent the same to build baths, washhouses, etc., or convert buildings for that purpose, and alter and amend from time to time; to enter into contracts of all kinds, but no contract above £100 to be entered into without notice by advertisement; if Commissioners think fit, they may purchase existing baths.

Section 31 and 32 empower the Council to make sale and exchange of lands with consent, and also to sell, after seven years' trial, any baths that may be found too expensive to be kept up.

Section 36 enacts, that the number of baths for the labouring classes shall be not less than twice the number of any higher class, if but one; or of all the baths of any higher classes, if there be more than one of such higher class.

In the next year, it was found necessary to amend this act in a few particulars; accordingly, the 11 and 12 Victoria, cap. 61, intitled, "An Act to amend the act for the establishment of Public Baths and Washhouses", received the Royal assent, 2nd July, 1847.

Section 4 incorporates the Lands Clauses Act, 1845, with this Act, but provides that the lands may be taken by agreement.

Section 5 enacts the same proportion of washing troughs for the labouring classes, as for baths, viz., twice the number of higher classes, if only one higher class, or an equal number with all the higher classes, if more than one higher class.

The progress of the establishment of baths and washhouses, as above described, was very slow; there were prejudices on the part of the wealthy, but there were also prejudices on the part of the poor. They called it "washing in public," and no persuasion could induce them to believe that there was not something derogatory in availing themselves of this boon; but they soon found that nothing was further from the fact than publicity. The early frequenters—the sensible few that always lead the way to the first enjoyment of offered privileges—soon found that in the washhouses they were, in fact, more private than in their homes. No critical neighbours could remark on the patched or darned apparel that hung in the back garden; they could bring their week's linen in their little covered basket, wash their scanty wardrobes in their own compartment, dry them in their own separate drying closets, carry them home again, "nobody any the wiser", except themselves, in the discovery of such a cheap, safe, and speedy refuge from all the domestic misery attendant upon the ill-starred "washing day", as formerly conducted. There were no "blacks" falling from neighbours' chimneys on their counterpanes,—no tears of

vexation keeping pace with the showers that rained the whole "washing day"; when all these advantages became apparent, the establishments soon became full, and were as popular as they were unpopular before.

The best and most convincing proof of the appreciation in which baths and washhouses are held by the public, and the gradually increased use made of their benefits as they became more generally known, will be best shown by the quotation, from the published returns, of a few simple figures.

At the four first establishments in London the increase has been as follows:—

	Bathers.	Washers.
In 1847	143,794	39,418
1848	160,628	61,690
1849	394,557	75,004
1850	595,797	133,177
1851	647,242	142,251

During the month ended July 1852, the receipts at the (now) six metropolitan establishments have amounted to the sum of £2768 : 5 : 5, against £1506 : 3 : 4 in the same period in 1851. The number of bathers was 199,934, against 104,856 in the corresponding month of 1851, shewing an increase of £1262 : 2 : 1 in money, and 95,078 bathers; in the month of the year 1848 the number was 7,934 bathers, and the receipts then amounted to £91 : 5 : 10 only.

The number of persons who have availed themselves of these advantages has steadily increased, till the number has amounted to five times the demand. The women are obliged to wait for their turn at the tubs, and the number of bathers has so increased, that it has cost considerable study to save time in the making and discharging of each bath, and, consequently, to accommodate a greater number of persons. In an establishment in a provincial town, with a population of 20,000, the number of bathers for the week ending August the 21st, was 2,016.

The extraordinary success of these buildings has led to the adoption of the system throughout the country. There are now in London seven establishments; at Liverpool three; and there are baths and washhouses, either complete or in progress, at Manchester, Birmingham, Bristol, Maidstone, Bilston, Norwich, Hull, Preston, Oxford, Wolverhampton, Macclesfield, Nottingham, Bolton, Worcester, York, Exeter, Hereford, Chester, Plymouth, Sunderland, Newcastle, Carlisle, Coventry, Belfast, and Waterford, and they are projected in many other places. In fact, they are found to be self-supporting, with scarce an exception, and in most instances they yield a profit.

So short a time has elapsed since their first establishment, and so great were their early difficulties, that the profits at first were nothing; and even now are not to be compared to what they probably will be. As long back as 1848, however, the Hampstead Road Baths produced a profit of £35 in a few weeks; and at Manchester, in the same year, a profit of £30 was realized. The present statistics shew that at Newcastle, when only opened a little more than a year, they paid 4 per cent. on the outlay, and at Chester 3½ over working expenses.

It is evident that the profits must increase as the utility of the system becomes apparent. This is already sufficiently evidenced in those establishments referred to above, that have been in operation sufficiently long to base any calculation, and which all, both metropolitan and provincial, shew a steady increase year after year. Cold and wet as the month of May 1850, was, the returns of four of the London establishments shew an average of £80 per week received, instead of £51, and there is every reason to believe that the profits will be larger year by year. The management will cost no more, and the only additional outlay is for fuel; and even this will not be increased in a large ratio, as steam must be kept up to a certain pressure, and the drying closets heated to a certain temperature, whether they be used by many or by few.

The returns from the Cornwallis Street Baths, Liverpool, for the year 1852, give : amount received, £1,585 : 7 : 10; working expenses, £1,055 : 2 : 10, leaving a surplus of £530 : 5 : 0. At

Birmingham, during some of the summer weeks, the return has been 11,000 bathers, and the receipts £150 weekly. The following abstract of receipts from washers and bathers at this establishment, gives a very satisfactory result, as to the *progress* of these establishments:—

Week ending	Bathers.	Washers.	Total.
Dec. 1851 . . .	£6 : 15 : 4	£3 : 13 : 3	£10 : 8 : 2
Dec. 1852 . . .	13 : 4 : 6	4 : 12 : 3	17 : 16 : 9

Like almost all early experiments, the first establishments have been very costly. It has been found necessary to take down, alter, and refix machinery at an immense outlay; even now it is evident that very great and expensive alterations must take place at many existing establishments before they can be worked effectively and economically.

The combination of practical knowledge, both for the design and construction of the building, and for the adaptation and execution of the machinery, is essential in undertakings of this kind; it is thus only that a unity of arrangement can be preserved throughout, and so a due economy attained.

This consideration is of the utmost importance, as the bare interest of the money, or all extra or unnecessary cost, is a fearful deduction from the profits.

Undue importance is, however, frequently attached to curtailing first outlay in the erection of baths and washhouses, which often in the end proves bad economy, as the extra expenditure caused by any necessary after-addition much exceeds what the entirety would have been if done at first, and the whole is not likely to be so complete; but as it is in some cases a question between a small outlay or no establishment, it may be useful to state that, with favourable position as to site and supply of water, £3,000, or even £2,000, would erect a very useful building, including the best machinery; but it is far better in towns exceeding 18,000 or 20,000 population to make a first outlay of from £5,000 to £6,000.

Two plans are given in Plate 1; Fig. 4, representing an arrangement for a large establishment, suitable for the metropolis or a first-rate city, and Fig. 3 such as should be erected for a provincial town with a population not exceeding 20,000;—the subsequent remarks on the details, etc., will generally apply to each of these plans. The larger building contains for men twenty-four first class, fifty-five second class, and three vapour and shower baths, with a plunging bath 16 ft. x 14 ft.; first and second class swimming baths each 65 ft. x 40 ft. On the women's side, fifteen first class, thirty-one second class, with plunging, shower, and vapour baths, similar to men's side. The washhouse department accommodates twenty-one first class, and fifty-two second class stalls, each containing a washing, boiling, and rinsing tub, as well as a drying closet; a washhouse is also shewn in which the business for the establishment, and for washing towels, is carried on. This building could be erected at a cost of about £14,000.

The smaller plan, Fig. 3, is arranged for five first class, and eight second class men's baths, with a plunging bath 17 ft. x 8 ft., two first, and four second class women's baths, a shower and vapour bath on each side, and a swimming bath 35 ft. x 24 ft. The washhouse contains ten washing stalls, arranged precisely the same as the larger plan. The cost of this building is £2,125.

Erections for this purpose should always, if possible, be on one floor only above the basement,—a matter of primary value as regards light, air, ventilation, avoidance of steps, and convenience of arranging pipes, etc.: the only exception being over the entrances, etc., where frequently another story is added, to contain the residence of the superintendent or other officers.

The plan should be made with the greatest compactness to ensure a minimum of cost. The larger establishment shewn covers an area of 2,930 yards, and the smaller of 417 yards.

In the basement should be placed the steam boilers, which, by means of a small engine, perform the duty of pumping water to a great cistern in the roof (of course, if the water is delivered at the level of this cistern by a water company or

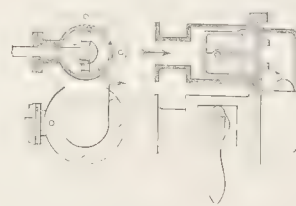
otherwise, this cost would be dispensed with). The boilers also supply steam for the boiling vessels in the washhouse, for the vapour baths, and any excess is used for warming apartments, heating towel closets, etc. Where inundation is to be apprehended, and it is consequently unadvisable to place the machinery in the basement, the stokery, etc. might be put at the back.

It is important here to notice the great economy attained in a minute adaptation of the waste heat and steam as well as water, etc., all of which may be made available, and thus tend to economise the working expenses.

It is easy, for example, to turn the overflow pipes, also the condensed water, etc. into the swimming bath instead of the drain, that the waste steam, instead of blowing away, should perform some duty; if no better adaptation can be found, it is always useful in the shaft to increase the draft and destroy the blackness of the smoke. In the Lambeth establishment, the authors intend to use the exhaust steam from the pumping engine as the medium of heating the two very large swimming baths averaging 150 feet long by 40 feet wide, and to turn the steam in at an angle with the side of the bath to cause a circulating motion of the water. It is worthy of remark, that in this establishment, the great first class swimming bath is to be filled by means of a fountain, which will keep the surface of the water in rippling motion, and it is believed that, while the latter will prevent the accumulation of what is ordinarily known as scum on the surface, the former will keep a due admixture of the steam-heating medium with the water.

To minor matters, such as the due clothing of pipes and boilers, and all heated vessels, it seems almost unnecessary to refer, and yet, satisfactory results are frequently frustrated for want of due consideration on these points.

As before remarked, much attention has been given to the production of a valve for the supply of water, to fill and empty the baths. A patent for an invention for this purpose has been taken out by the authors of this essay, and found to act very



satisfactorily; the peculiarity consists in the pressure being at the back of the valve, and in the conical shape of the ground surfaces, into which the column of water at the back always tends to force the plug; the same form

insuring tightness with wear. In the centre is a mixing box for the hot and cold water, delivered on either side, so that an equable temperature is maintained, obviating the difference in the degree of expansion and contraction; the cause of leakage in most articles for similar purpose.

A bath can be got ready with these valves in thirty-two seconds. They are manufactured and executed in a very superior manner by Sylvester and Co. of Great Russell Street, Bloomsbury, and Potter of South Molton Street.

As, in establishments of this kind, it is important every thing should be as clean and bright as possible, it is essential that the chimney should be lofty and active, and, if possible, one shaft carrying everything away with it. This shaft is also of great use to ventilate the apartments, especially the washhouse.

The greatest care should be taken in procuring a pure soft water for the purposes of washing and bathing. The value of softness in water, for such purposes, can hardly be estimated, and should always be a leading point of consideration in the selection of a site. The fact that, where hard water is used, 10s. for each person is the cost of soap and water—6s. 8d. for soap and 3s. 4d. for water in the London district—proves how much economy, in large establishments, is to be attained by a due attention to the quality of this article. Animal deposit and organic impurity may be easily removed by filtering; but the

lime, causing hardness, is not so got rid of. The process of filtration is simple and inexpensive, except where the water is delivered by companies who have not provided proper filter beds.

In the evidence given by Dr. Clarke, printed in the first Report of the Commissioners of the Health of Towns Act, he states, that "Supposing we had the choice of several waters, there is no single quality to which I should attach more importance than *softness*." And again, "With regard to the softness of water, this quality is of importance; not merely for the saving of soap, and agreeableness for washing and bathing, but also in respect to the wear and tear of linen due to hard water."

Dr. Lyon Playfair, in his lecture on the chemical properties involved in the manufactures of the Great Exhibition, gives the following astounding figures in connexion with this subject.

"The annual charge of washing to the metropolis is £1,535,060, which is equal to above a twenty-fifth of the whole capital invested in the cotton manufactures of the United Kingdom. Hard water usually contains lime; and in washing, that earth unites with the fatty acid of soap, producing an insoluble body, of no use as a detergent. For 100 gallons of Thames water, 30 oz. of soap are thus wasted before a detergent lather is formed. In personal ablution, we economise this excessive waste by the uncomfortable practice, universally followed in London, of taking about an ounce of water into the hands, and converting it into a lather, the water in the basin being only employed to rinse this off, instead of aiding in the detergency. But in washing linen, this plan cannot be followed, every particle of lime being removed before the soap becomes useful; this, as a matter of economy, is frequently accomplished by carbonate of soda, as being cheaper than soap. The amount of soap and soda thus wasted in the metropolis has been stated to be equal to the gross water rental."

In arranging buildings for the purposes of baths and washhouses, there should be an absolute division effecting an entire separation of sexes. The centre should comprise a residence for the superintendent, waiting halls for both men and women, pay office, etc., with the swimming baths, etc.

At the establishment at Maidstone, a range of private bath rooms have been constructed, and fitted up in a superior manner as regards furniture, and with a towel closet heated with a coil of pipes, and with the apparatus for vapour or shower baths. These rooms average 9 ft. \times 8 ft., making a superior class, reserved for a higher rate of charge.

The swimming baths should be made with a surface light and clean, and it is important it be non-absorbent; glazed bricks have in some cases been used, and are defective only in the number of the joints: slabs of terra cotta, 9 ins. square, and 2½ ins. thick, are made by the Llysnewydd brick Company, Swansea, with a glazed surface, in white and blue colours; these have been used, and form a very beautiful bath; the dressing boxes ranged round the bath, are constructed of wood framing, they are each 4 feet long, by 3 feet wide, with a seat, hat pegs, and a wood foot grating in each.

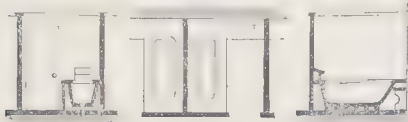


Fig. 6, Section.

Fig. 6, Plan.

Fig. 7, Section.

Baths are made of copper, zinc, glazed tiles, slate, marble, or of glazed porcelain in one piece. Very many experiments have been made, and a variety of conflicting opinions given on the relative value of each material; the objections to those which require a painted or enamelled surface are obvious, in the action which the water and soap are found to exert on the composition of these surfaces, which contain generally a large amount of oleaginous matter.

The glazed tile baths are much approved, and of late years ARCH. PUB. SOC.

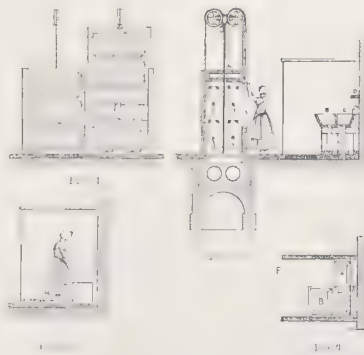
have been very generally used; but by far the most perfect bath is that of glazed porcelain in one piece.

The walls or sides of these are about two inches thick, in which fine clay, china clay, and the glaze, are so assimilated, that the two clays are of the same porosity, bear the same heat, and expand and contract together, and the glaze will melt only when the fine clay is sufficiently burned. These baths avoid the only objection to the tile baths, viz. the frequent joints, and consequent irregularity of surface. They are made of the following dimensions, 5 ft. 3 ins. long, 2 ft. 4 ins. wide at head, 2 ft. at foot, and 1 ft. 11 ins. deep. They have been brought to perfection after a long and expensive series of experiments, for which much credit is due to Mr. Rufford of Stourbridge, the manufacturer, and his energetic coadjutor, Mr. Paul Mathews.

In fitting up these bath rooms, it is important, as much as possible, to adopt the use of material which is not injured by steam or moisture; and for this reason, the looking-glass frame, soap dish, handle to door, clothes' pegs, etc., are all made in porcelain, so as not to be liable to rust or contract dirt. An elaboration of this is intended to be executed by the Llangollen Slate Company, in the new Lambeth Baths and Washhouses. The first class men's baths are placed in a gallery, round a portion of the great swimming bath, supported by iron brackets and columns. The slate divisions and the doors will be enamelled, so as to give them a pure white glaze.

The divisions between the baths and washing boxes shown in the plans, and also in the details, Figs. 6 to 12, are made of slate, with slate doors, answering all the purposes of privacy, at the same time that no impediment is offered to the free circulation of air throughout the one large apartment.

The compartments in the washhouses shown on the plans, are each complete in themselves, viz. they should contain a wash-tub, B, Fig. 9; a vessel for boiling clothes, C; a tub for rinsing, A; D, wringing board; and a drying closet, as shown Fig. 10. The arrangement of these compartments is exhibited in



detail in Fig. 9, plan of tubs; Fig. 10, section of washing and drying closets; Fig. 11, elevation of two drying closets, one with the door raised, the other shut; and Fig. 12, section of stall at E F, on Fig. 9. The rinsing tub is a feature not universally adopted: it has the great advantage of saving the necessity of discharging the heated and softened water from the wash-tub, and thus economizes fuel. Each compartment should have a perforated foot-board, raised a little above the floor, and the tubs should be heated by steam.

It is advisable, when the site will admit of such an arrangement, that a separate entrance should be given to the washhouse, distinct from the baths, that no confusion in the different departments should arise. In the former, hydro-extractor wringing machines are provided to each group of washing compartments, in the position shown on the plans; these, in the course of a few seconds, remove fifty per cent. of the moisture from the linen, and consequently facilitate the rapidity of drying.

The following table of the results of washing, wringing, and drying, at the Goulston Square establishment, exhibits the value of these wringing machines:—

Description of Article.	No. of articles.	Washing.	Wringing.	Drying.	Value of articles.	Value of articles after washing, wringing, and drying.
12 bathers' towels	7 11	16 12	11 12	6 19	2 30	200
ditto	7 13	16 15	11 13	6 14	2 25	210
3 fine sheets	4 15	13 2	8 4	4 3	2 15	180
3 middling do.	5 4	14 1	8 3	4 12	2 25	160
3 coarse ditto	7 8	16 2	5 0	6 15	2 30	100
3 small blankets	6 15	22 1	9 10	4 3	2 15	200
ditto	6 10	21 4	9 1	6 0	2 15	200
3 large ditto	9 1	24 14	12 3	8 12	3 25	210

The object of contriving the whole process of washing and drying in each compartment, is obviously for the sake of privacy; and, in provincial towns, must be of even more importance than in the metropolis, where it is less likely that the occupant will meet with any one of her acquaintance. It is necessary to seek an arrangement that shall prevent the necessity of exposing the possibly ragged linen of a washer to her neighbours, or congregate any number of them together—a rendezvous for gossip.

The method of having the drying horses together in one place, away from the washing box, although the easiest to construct, is decidedly objectionable, being a place of lounging, and does away entirely with the comfort and privacy the other plan gives; and this is, as before observed, a point of vastly greater importance in a provincial town than in the metropolis.

The system formerly pursued of heating drying closets by steam has been found so imperfect, that other methods have been sought, by which greater rapidity in drying could be attained. It is well known by brick makers, that however hot the day may be, the bricks will not dry unless there be some movement in the air, to carry off the vapour as soon as formed; the same fact is also observed in the process of drying hops; in hay-making, and, in fact, everywhere in which quick drying is necessary. Injected currents of highly desiccated air in rapid volumes, imitating the rush of the hot winds of eastern climates, whose rapidly drying powers are the wonder of Europeans, will be found to be the most successful principle.

At Maidstone, where there is a steam-engine, an apparatus something on the principle of the centrifugal pump has been fitted up for this purpose. At Bilston and other places, where there is no engine, a system has been adopted of causing air to pass through red-hot coke, and thence diffusing it by a series of pipes, so as rapidly to circulate through the wet linen.

The results of the first described closets, with a temperature of only 130°, has been that heavy blankets have been perfectly dried in twenty minutes, and light articles in *three minutes*.

No accommodation is necessary for ironing and mangling. In some of the establishments, where they have been provided, they have been found comparatively useless, even in London; and in a provincial town, we should think them positively objectionable, as the ironing is not unhealthy to be done at home, and the mangling is a small source of living to many poor persons, which would be lost if it were done in a public establishment.

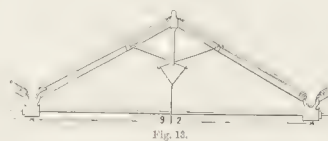
In the report also of the Goulston Baths, in 1848, after detailing the number of washers, driers, etc., it is observed: "No ironing appears to have been done." If it be considered advisable, however, to have such accommodation, a room is always easily added for that purpose, as it is entirely distinct from the other processes.

An addition of great value has been made to these establishments at Liverpool, and, up to the present time, we believe, at Liverpool only: a place set apart for washing infected linen,—it should be entirely detached,—in which the clothes of persons ill of infectious disorders are received and washed for them without any charge, a note from a medical man being all that is required to procure this aid.

A novel addition of great value to the washing establishment, is intended to be made at the Lambeth Baths and Washhouses, in adding an infant school, where the poor washers may safely leave their young children, while they are engaged in the wholesome duty of purifying the household linen. The fact of being obliged to leave an infant at home, exposed to all the chances of accident and neglect, have deterred at least one-half of those who would gladly have accepted this boon, afforded by the new washhouse, from availing themselves of it. In this instance, the authors have given a room for the children of those engaged within; and the kindness of the directors will provide a competent person to assist in their care, and, as much as can be, in the development, of their youthful minds.

Buildings for the purposes of baths and washhouses should be erected in a substantial manner; all superfluous ornament, and the adaptation of Gothic or other masks, ought to be forbidden; a character of cheerfulness should be given to them, which the architect will know well how to stamp with an expression of its purpose.

The internal fittings should in all cases be of the simplest and strongest kind, and, wherever possible, of a material not liable to corrode: the rooms should be lofty, finished quite plainly, and left white, with a strict avoidance of dark corners, or places in which dirt could accumulate. The roof shown in Fig. 13,



constructed on the ridge and furrow principle, of substantial construction, and covered partly with glass and partly with

slate, is admirably adapted for buildings of this character.

One of the most important considerations in the erection of these establishments, is the selection of a fit site.

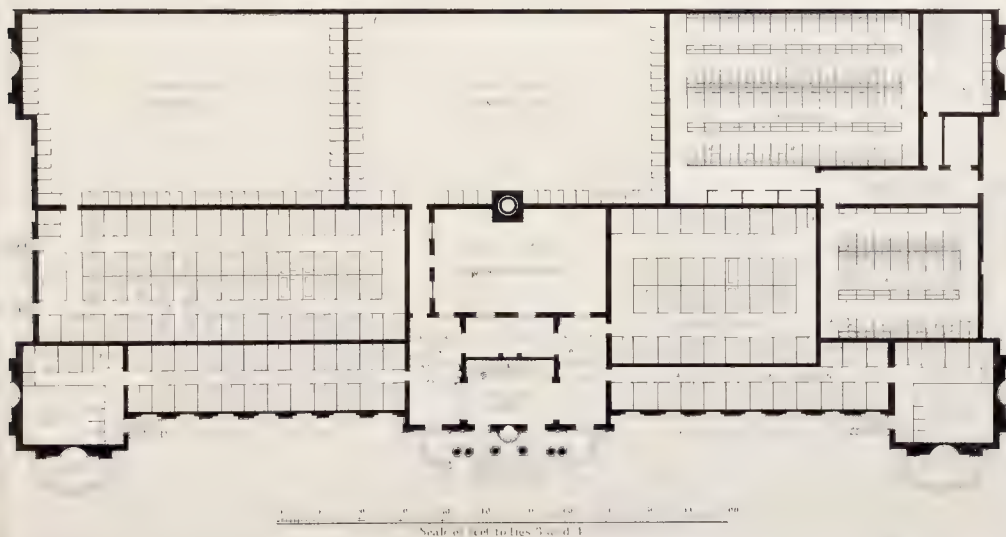
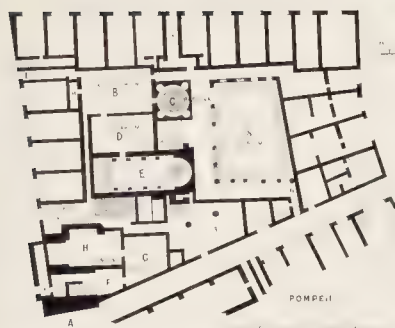
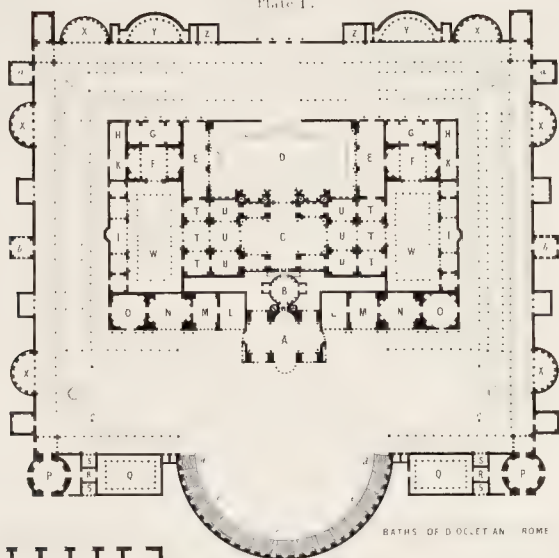
First, then, it should be in a position in which it could be supplied with an unlimited quantity of soft water; secondly, it should occupy a prominent position, to be seen by every one; thirdly, it should be central, and have good approaches.

The principles above detailed, but in a modified form, may be well carried out for the use of hotels, and even of private houses, with the most beneficial effects as regards comfort and economy. In hotels, particularly, the saving of labour and time in the washing, and the convenience of thoroughly drying and airing linen for immediate use would be most sensibly felt; and by combining apparatus for the baths with these, would prove a very beneficial speculation.

Large sums are cheerfully spent for the shelter of the lunatic, and for the punishment of the culprit, and it is hoped that there will be no stint in the expenditure of much less sums for the improvement of the moral and physical condition of the labourer; the more so, as the money is but lent, as it were, for a time. The union house, the lunatic asylum, the prison, are all connected with saddening ideas—all are necessary evils; but every establishment that elevates man in his moral organization diminishes these evils; and if it be true, as the concurrent testimony of all wise and good men has confessed, that "cleanliness is next to godliness", we must rank these institutions as next in worth and importance to our schools. Even if we take lower and more selfish views, we must consider that these establishments are self-supporting, if not remunerative; and we must remember that the pestilence of the nineteenth century, though it requires dirt and filth to generate its first breathings, yet, when arrived at vigour and activity, it sweeps on like the simoon, and strikes down the rich as well as the poor. It is too much to expect of any human institution that it shall eradicate all evil, and cure all disease; but when a remedy is known, either moral or physical, heavy is the responsibility of those who can use it, and will not.

ASHPITEL AND WHICHCORD,
Architects and Engineers.

BATHS AND WASHHOUSES.
Plate I.



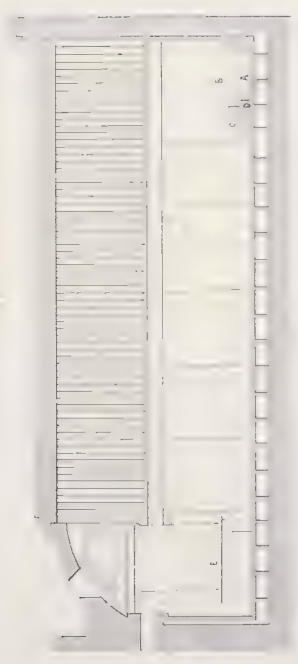




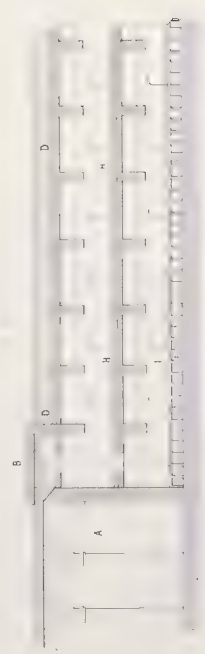
SECTION ON LINE E F ON PLAN FIG. 7



PLAN OF A
TURKISH BATH



SECTION OF THE CALDARIUM
POMPEII



CASTELLUM OF ANTONINUS



SECTION AT B FIG. 2













